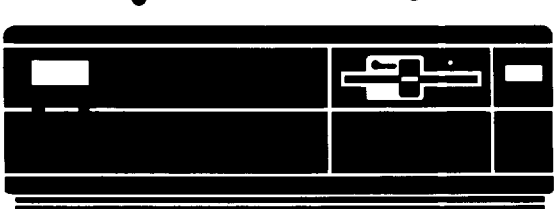
SX386MC

OPERATIONS GUIDE

TriGem



SX386MC

OPERATIONS GUIDE

GERMAN RFI DECLARATION FOR CLASS B SELF CERTIFICATION

Hiermit wird bescheinigt, dass der TriGem SX386MC in Übereinstimmung mit den Bestimmungen der Vfg 1046/1984 funk-entstort ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

TriGem Inc.
4 NaengChun-Dong, Seodaemun-Ku
Seoul, Korea

English translation:

We hereby certify that the TriGem SX386MC complies with the RFI suppression requirements of Vfg 1046/1984. The German Postal Service was thenotified that equipment is being marketed; The German Postal Service has the right to re-test the equipment and verify compliance.

Note: Replace 1046 with 1045 for household appliances tested per VDE 0875.

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

If you experience problems with radio and/or television reception through the use of this product, the following booklet, published by the FCC, may prove helpful:

How to identify and Resolve Radio-TV Interference Problems (Stock No. 004-000-00398-5)

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402.

WARNING!
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

SAFETY

The following instructions pertain to the risk of fire, electric shock or bodily injury. Please read all of these instructions carefully.

- ❑ Follow all of the instructions and warnings marked on this product or included in this manual.
- ❑ Do not use this computer on an unstable cart, stand or table.
- ❑ Slots and openings in the cabinet and the back have been provided for ventilation. To ensure the reliable operation of your computer, and to protect it from overheating, these openings must not be blocked or covered. Don't use this product on a bed, sofa, rug, or other similar surface.
- ❑ Never push objects of any kind into the computer through the cabinet openings, as they may touch dangerous voltage points or short out parts that could result in a fire or electrical shock.
- ❑ This computer should only be connected to the AC power source indicated on your computer system's information label. If you are not sure of the type of AC power available, consult your dealer or local power company. Only connect this computer to a power outlet that matches the power requirements of this computer.
- ❑ Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.
- ❑ If you have to use an extension cord with this computer, make sure that the total amperage rating of all equipment plugged into it does not exceed the amperage rating of the extension cord. Also, make sure that the total of all products plugged into the main AC power outlet does not exceed 15 amps.
- ❑ Unplug your computer from the main electrical power outlet before cleaning.
- ❑ Do not use this computer near water.

MAINTENANCE

Except as explained in Chapter 7, "Expanding Your System," do not attempt to modify or service this product yourself. Opening or removing those covers that are marked "DO NOT REMOVE" may expose you to dangerous voltage points or other risks. Refer all servicing problems to qualified service personnel.

If the product does not operate normally, adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage and may require extensive repair work to restore the product to normal operation.

Unplug this product from the main power outlet and call for service under any of the following conditions:

- ❑ If the power cord or plug is damaged or frayed
- ❑ If liquid has been spilled into the product
- ❑ If the product has been exposed to rain or water
- ❑ If the product has been dropped or the cabinet has been damaged
- ❑ If the product exhibits a distinct change in performance, indicating a need for service

Stop!

If you ever have to remove the main system unit cover, observe the following precautions:

- The power supply cord must be unplugged before the main system unit cover is removed. (Separe le cordon d'alimentation et puis enleve le couvercle.)

- Once removed, the cover must be replaced and screwed in position before the power supply cord is plugged back in. (Apres-le couvercle a enleve, visse le couvercle en place et remettre le cordon d'alimentation.)

RELATED READING

For more information about MS-DOS commands and GW-Basic programming, please refer to the user's manuals provided with this computer.

Wichtige Sicherheitsvorschriften Unbedingt beachten!

Allgemeine Sicherheit

Die nachfolgenden Anweisungen betreffen die Gefahr von Verletzungen durch elektrische Spannung, Feuer und mechanische Einwirkung. Bitte lesen Sie diese Anweisungen sorgfältig.

Beachten Sie alle Hinweise, die am Gerät selbst angebracht oder in den zugehörigen Handbüchem vermerkt sind.

Stellen Sie das Gerät an einem sicheren, stabilen Arbeitsplatz auf.

Am Gerät angebrachte Öffnungen (Schlitze und sonstige Offnungen) dienen der Belüftung des Gerätes. Um ein zuverlässiges Arbeiten des Geräts zu gewährleisten und um Überhitzung zu vermeiden, müßen diese Öffnungen unbedingt freigehalten werden. Betreiben Sie das Gerät nie auf Betten, Sofas oder anderen, wiechen Unterlagen.

- Stecken keine Gegegenstände (Schraubenzieher, Büroklammem etc.) in die Öffnungen. Sie würden damit Kurzschlüsse herbeiführen die zur Zerstörung des Geräts führen, sich der Gefahr eines Stromschlages aussetzen oder das Gerät in Brand setzen.

- Das Gerät darf nur an vorschriftmäßige Steckdosen mit der auf dem Gerät angegebenen Netzspannung angeschlossen werden. Wenn Sie nicht sicher sind, welche Netzspannung richtig ist, wenden Sie sich an den Lieferanten des Gerätes oder an das zuständige Elektriziträtswerk. Bitte nur an genügend stark abgesicherte Steckdosen anschließen, die der Leistungsaufnahme des Gerätes entsprechen.

- Auf das Netzanschlußkabel dürfen keine Gegenstände gestellt werden. Legen sie das Netzkabel so, daß niemand darauftreten oder darüber stolpem kann.

- Wenn Sie Verlängerungskabel benutzen, müßen Sie sicher sein, daß die gesamte Leistungsaufnahme nicht größer ist als das Verlängerungskabel zuläßt. Der gesamte Stromverbrauch aller angeschlossenen Geräte darf nicht mehr als 15 A betragen.

- Wenn Sie das Gerät reinigen, muß das Netzkabel aus der Steckdose gezogen werden.

- Das Gerät dürfen Sie nicht in der Nähe von Wasserleitungen benutzen.

Wartung des Computers

Wenn der Computer nicht ordnungsgemäß arbeitet, durfen Sie nur die Finstellungen vomehmen, die im Handbuch genannt werden. Andere Einstellungen oder Veränderungen können den Computer beschädigen oder zerstören. Umfangreiche und kostspielige Reparaturen würden notwendig werden, um das Gerät wieder betriebsfähig zu machen.

Ziehen Sie den Netzstecker aus der Steckdose und verständigen Sie den zuständigen Kundendienst bei folgenden Störungen:

- netzkabel ist defekt oder strak abgenutzt.

- Flüssigkeit ist in dassGerät geschüttet worden.

- Das Gerät war Regen oder Leitungswasser aus-gesetzt.

- Das Gerät ist heruntergefallen oder das Gehäuse ist beschädigt.

- Das Gerät arbeit nicht mehr richtig.

ACHTUNG:

Wenn Sie das Gerät öffnen mößen (Abnahme der verschraubten Haube), ist unbedingt folgendes zu beachten:

- ❑ Das Netzkabel muß aus der Steckdose gezogen werden und zwar bevor Sie das Gerät öffnen.

- ❑ Die Haube muss wieder monitert und verschraubt werden. Erst dann darf das Netzkabel wieder eingesteckt werden.

Contents

Introduction 1
How to Use This Manual 2

Chapter 1 **Setting Up Your System**

1. Unpacking 1-1
2. Choosing a Location 1-2
3. Connecting a Monitor 1-4
4. Connecting a Printer, Mouse, or Modem 1-6
   Using the Parallel Interface 1-6
   Using the Serial Interface 1-7
5. Connecting the Power Cord 1-8
6. Connecting the Keyboard 1-10
   Adjusting the Keyboard Angle 1-11
7. Turning On the Computer 1-12
   The Command Prompt 1-15
8. Copying System Diskettes 1-15
9. Resetting Your Computer 1-18

Chapter 2 **The CMOS Setup Program**

Introduction 2-1
When to Run Setup 2-1
   Using Setup 2-2
Entering Setup 2-3
   Parameters 2-5
Leaving the Setup Program 2-10

Chapter 3 **Using Your Computer**

Changing the Operating Speed 3-1
Special Keys on Your Keyboard 3-2
Stopping a Command or Program 3-5
Using Disks and Disk Drives 3-5
How Disks Store Data 3-6
Types of Diskette Drives 3-8
Caring for Diskettes and Diskette Drives 3-10
Inserting and Removing Diskettes 3-12
Write-protecting Diskettes 3-14
Making Backup Copies 3-15
Using a Single Diskette Drive 3-16
Using a Hard Disk Drive 3-17

Chapter 4 **Using MS-DOS With Your Computer**

Inserting Diskettes 4-2
Disk Drive Letters 4-2
Starting MS-DOS 4-4
System Prompt 4-5
Cursor 4-6
MS-DOS Commands 4-6
Case Sensitivity 4-7
Function Keys and MS-DOS 4-7
BACKSPACE Key 4-8
Default Drive 4-10
Copying Your MS-DOS Diskettes 4-11
Copying on Single Drive Systems 4-12
Copying on Dual Drive Systems 4-16
Files 4-19
FileTypes 4-20
Filenames and Extensions 4-20
Disk Directories 4-23
The DIR Command 4-23
File Searches 4-24

Multiple Disk Drive Systems 4-25
Wildcards 4-26
Application Software 4-27

Chapter 5 **Using Floppy Disks**

Description . . . . . 5 - 1
How Floppy Disks Work . . . . . 5 - 2
Formatting Diskettes . . . . . 5 - 3
The FORMAT Command . . . . . 5 - 4
Option Switches . . . . . 5 - 6
Copying Files 5-10
WIldcards 5-12

Chapter 6 **Using Your Hard Disk**

What is a Hard Disk Drive? . . . . . 6 - 1
Care of Hard Disk Drives . . . . . 6 - 2
Preparing Your Hard Disk . . . . . 6 - 3
Changing Your SETUP . . . . . 6 - 4
Partitioning Your Hard Disk . . . . . 6 - 7
Formatting Your Hard Disk . . . . . 6 - 9
Organizing Your Hard Disk 6-11
Backing Up Your Hard Disk 6-16
The BACKUP Command 6-16
How Many Diskettes? 6-17
The RESTORE Command 6-19

Chapter 7 **Expanding Your System**

Connecting Peripherals 7-1
Serial Ports 7-3
Parallel Ports 7-4
Connecting Printers 7-4
Connecting Modems 7-4
Connecting External Disk Drives 7-5
System Expansion & Upgrades 7-4
Tools Required 7-4
General Precautions 7-6
Opening and Closing the Cabinet 7-8
Installing Circuit Boards 7-10
Disk Drive Compartments 7-13
Internal Hard Disk Drive 7-15

Appendix A **Specifications**

Computer System A-1
System MotherBoard A-1
CPU Logic A-2
System Memory A-3
System I/O A-4
SystemTiming A-4
I/O Address Map A-4

Appendix B **System MotherBoard**

Hardware Settings B-1
Removing the MotherBoard B-3
Headers B-3
Connectors B-4

Appendix C **Video Monitor Systems**

Monitor System Resolution C-1
Video Controller Boards C-1
Monitor Types C-4

Appendix D **Connector Pinouts**

I/O Ports D-1
Expansion Slot Connectors D-5

Appendix E **Advanced ROM Diagnostics**

Introduction E-1
When to Run Advanced Diagnostics E-1
Starting Advanced ROM Diagnostics E-2
Advanced ROM Diagnostics Tests E-4
Hard Disk Diagnostics E-5
Floppy Diagnostics E-32
Keyboard Diagnostics E-48
Video Diagnostics E-49
Miscellaneous Diagnostics E-5l

Introduction

Your TriGem computer is powerful, versatile, and easy to use. After setting up your system with the simple instructions in this manual, you'll soon be using your favorite software programs.

This computer is available in these configurations:

- The System provides one 1.2MB (megabyte) diskette drive and an optional 40MB (or 80MB) hard disk drive.

- You can operate a lot of application programs very fastly and efficiently with this system because it provides 32KB cache memory.

This model comes with 2MB of internal memory, a total of five internal option slots, a System Motherboard an on board IDE type HDC and built-in serial and parallel interfaces.

Your computer comes with MS-DOS — the operating system by Microsoft. In addition to the introduction to MS-DOS provided in this manual, you'll find a complete reference manual for the operating system packed in the box with the computer.

As your needs grow, so can your computer; you can expand your system by adding a wide variety of options. You can install most option cards compatible with the IBM Personal Computer. If you use software that executes lengthy mathematical calculations, you may want to install an 387sx™ math coprocessor to speed up processing.

How to Use This Manual

This manual explains how to set up and care for your computer.
It also describes how to use your computer.
The instructions in this manual apply to your system, except where otherwise indicated.

You probably don't need to read everything in this book; see the following chapter summaries.

Chapter 1 provides simple step-by-step instructions for setting up your computer.

Chapter 2 describes how to run the Setup program to setup your computer's configuration.

Chapter 3 covers some general operating procedures, including how to use and care for your disks and disk drives.

Chapter 4 provides basic instructions for using MS-DOS with your computer.

Chapter 5 takes you into the more advanced techniques of floppy disk file manipulation, such as formatting and copying.

Chapter 6 shows you how to set up and use the vast storage capabilites of this system device.

Chapter 7 contains "how-to" information on adding components (such as additional disk drives or expansion boards), to your computer.

At the end of this guide is a set of Appendices which contain technical information for the advanced user or field technician.

Chapter 1

Setting Up Your System

Setting up your personal computer is easy. Just follow the nine steps in this chapter.

When you finish setting up your computer, go on to Chapter 2 and follow the instructions there to run the Setup program. The Setup program updates the list of equipment installed in the computer and any time options are added or changed.

1 Unpacking

As you unpack the different parts of your computer system, be sure to inspect each piece. If anything is missing or looks damaged, contact the place where it was purchased for missing items or replacements. If you cannot obtain the necessary part of parts, call your TriGem Computer dealer for assistance. Please have the computer's serial number ready when you call.

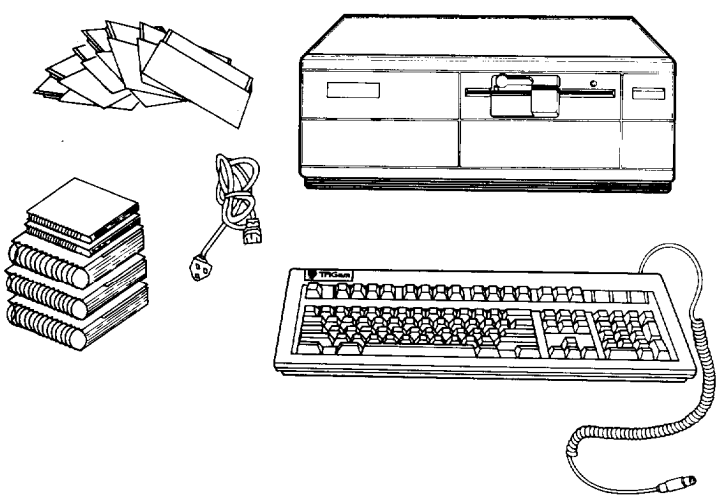


Figure 1-1. Unpacking Your System

Besides this manual, you should have the following:

- The computer and power cord
- The Keyboard with attached cable
- MS-DOS diskettes
- GW-BASIC diskette
- MS-DOS User's Guide
- GW-BASIC User's Guide

In addition to these items, you need a compatible monitor to use with the computer.

Be sure to keep your packing materials. They provide the best protection for your computer if you need to transport it later.

2 Choosing a location

Before you set up your computer, it is important to choose the right location. Select a spot that provides the following:

A large, sturdy desk or table that can easily support the weight of your system, including all of its components: Make sure the surface is hard and flat. Soft surfaces like beds and carpeted floors can generate static electricity, which may erase data on your disks and damage the computer's circuitry. Soft surfaces also prevent proper ventilation.

- Good air circulation: Air must be able to move freely under the system as well as behind it. Leave several inches of space around the computer to allow ventilation.
- Moderate environmental conditions: Protect your computer from extremes in temperature, direct sunlight, or any other

source of heat. High humidity also hinders operation, so select a cool, dry area. Avoid dust and smoke, which can damage disks and disk drives and cause you to lose valuable data.

- Appropriate power sources: To prevent static charges, connect all your equipment to three-prong, grounded outlets. You need one outlet for the computer, one for the monitor, and additional outlets for a printer and any other peripherals.

  If it has the appropriate power cord, you can plug the monitor into the auxiliary power outlet on the back panel of the computer,. reducing the number of wall outlets you need. (The current required by the peripheral must not exceed 1 amp.) If you need more outlets, you may want to buy a power strip-available at any electronics store-to provide extra outlets. A power strip with surge suppression is recommended.

- No electromagnetic interference: Locate your system away from any electrical device, such as a telephone, that generates an electromagnetic field.

3 Connecting a Monitor

The video display monitor is the device used by-the computer to communicate with you. Your software will use the screen to display information, such as prompts, text, graphics (charts and pictures), etc.

Several types of monitor are available as options. A typical video display system provides a high resolution monochrome (green or amber screen) screen display. Your computer can be with either monochrome, color video monitors, EGA or VGA monitor.

In addition to the display monitor itself, the video system includes a video controller board. This board generates the letters, numbers, and graphics symbols displayed on the monitor screen.

Connectors are provided for the display type that is supported by the board (monochrome, RGB color, high resolution EGA, VGA etc.). Certain boards support more than one type of display, and may provide a switch to select either color or monochrome modes.

> **Note**
> For more information on the various video monitor systems available for your computer system, see Appendix C, "Video Monitor Systems."

The procedure you use to connect your monitor to the computer depends on the type of monitor you have. See your monitor manual for detailed instructions, or follow these general guidelines:

1. Place your monitor on top of or near the computer. It is easiest to connect the monitor cable if you are facing the back panels of both the monitor and the computer.

2. If necessary, connect the monitor cable to the monitor. (Some monitors come with permanently attatched cables.)

3. Connect the monitor cable to the video connector on the back of the computer, as shown below. If the plug has retaining screws, tighten them securely.

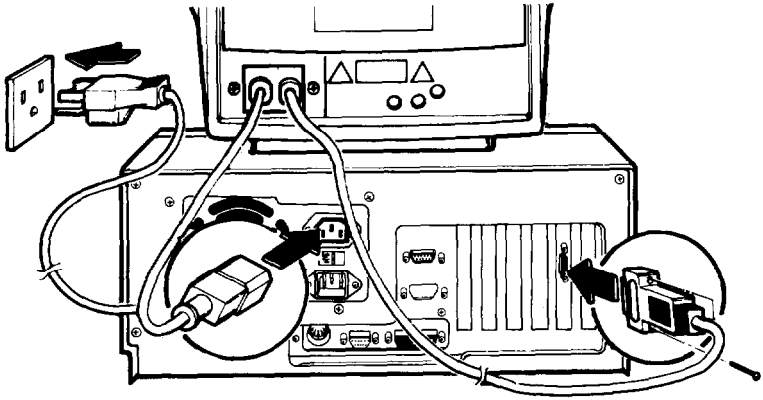


Figure 1-2. Connecting the Monitor

4. Plug the other end of monitor's power cord into an electrical outlet.

4 Connecting a Printer, Mouse, or Modem

The computer has a parallel interface and two serial interfaces on the back panel, so you can easily connect a printer or other type of device with either type of interface.

For example, you can use the parallel port to connect a parallel printer (most printers have a parallel interface). You can use , the serial port to connect a serial printer, a serial mouse, or an external modem.

Follow the steps in this section to connect a printer or other peripheral device to either the parallel or serial interface.

Using the Parallel Interface

The parallel interface on your computer is Centronics compatible and uses a 25-pin connector. To connect a parallel printer to your computer, you need an IBM-compatible printer cable. If you are not sure which one you need, or whether you have the right one, check with the store where you purchased the printer.

Once you have the correct printer cable, follow these steps to connect the printer to the parallel interface on the computer.

1. Place the printer next to your computer.

2. One end of the printer cable has a 25-pin, male connector. Connect this end to the parallel port on the back panel of the computer, as shown below.
   If the plug has retaining screws, tighten them securely.

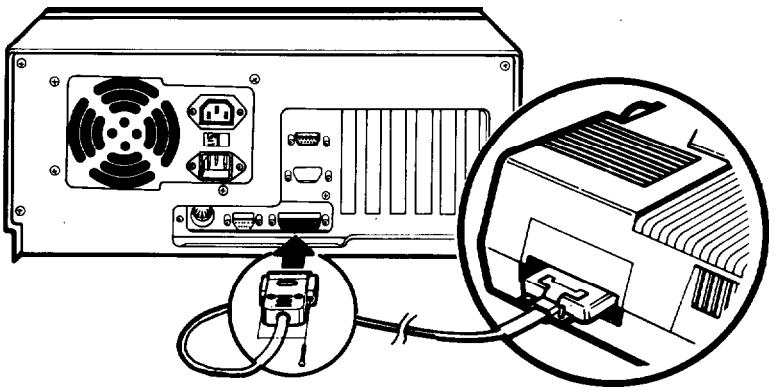


Figure 1-3. Connecting the Printer

3. Connect the other end of the cable to the printer, as shown below. If the printer has retaining clips on each side of the printer port, squeeze the clips together to secure the cable.
4. Plug the printer's power cord into an electrical outlet.

Using the serial Interface

If you have a serial printer, modem, mouse, or any other peripheral with a serial interface, you can connect it to one of two serial (RS232C) ports on the back of the computer. Your computer uses IBM-compatible, 9-pin, male connector, so be sure you have the proper cable. If you are not sure which one you need, or whether you have the right one, check with the store where you bought the cable.

To connect a serial device, follow the same steps outlined above for a parallel device, but connect the cable to the serial port, shown below.

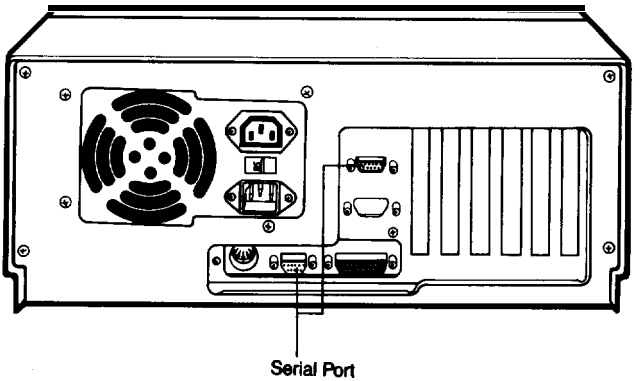


Figure 1-4. Serial Port

Setting up-the serial port for a printer

If you are using a serial printer but your software does not support a serial printer, you must do two things before you can print:

- ❑ Set up the data transmission parameters for the serial port.
- ❑ Tell the computer to redirect printer data from the parallel port to the serial port.

5 Connecting the Power Cord

Follow these steps to connect the power cord:

1. Insert the power cord into the AC inlet on the computer's back panel, as shown below. To avoid an electric shock, be sure to plug the cord into the computer before plugging it into the wall socket.

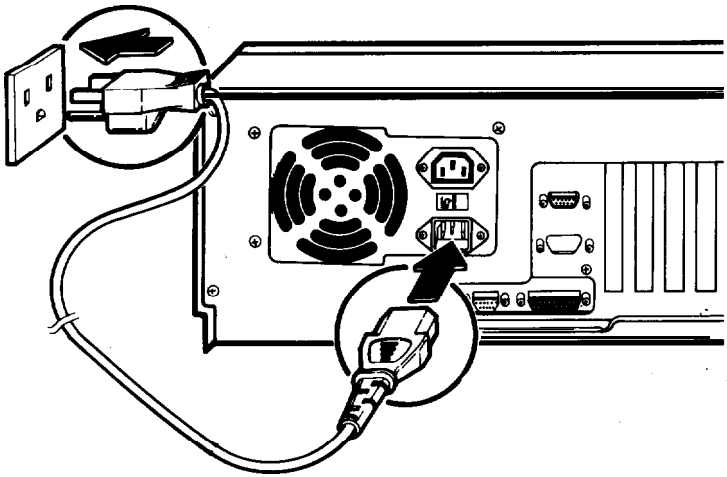


Figure 1-5. AC Power Connections

2. Plug the other end of the power cord into a three-prong, grounded electrical outlet.

Note

The socket-c&let should be installed near the equipment and should be easily accessible.

Die Verbindung zwischen Steckdose solite mölichst Kurz sein. Die steckdose sollte frei zugäglich sein.

For units to be installed in European countries, a power supply cord of type HAR, with H05W-F should be used.

Für Geräte, die in europäschen Ländern eingesetzt werden, sollte ein Netzkabel Typ HAR mit der Mummer H05 W-F benutzt werden.

6 Connecting the Keyboard

Your keyboard has only one cable to connect.
This simply plugs into the keyboard connector located at the bottom of the main system unit's rear panel. This connector is designed to prevent insertion if the pins don't line up, so it may be necessary to rotate the cable connector until it plugs in easily.

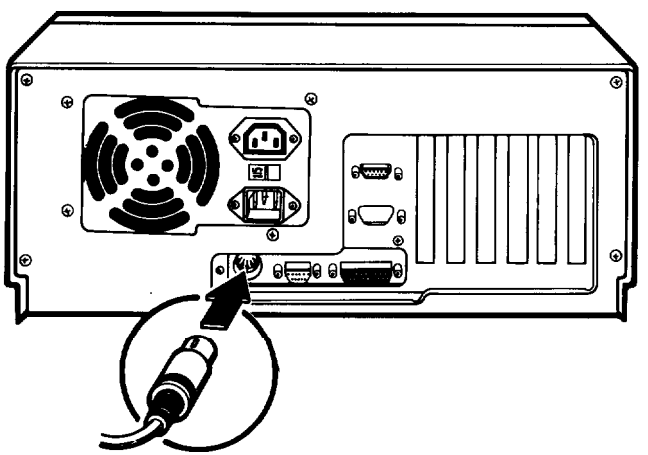


Figure 1-6. Connecting the Keyboard

Adjusting the Keyboard Angle

You can change the angle of the keyboard by adjusting the legs on the bottom. Turn the keyboard over and lift each leg upward until it locks into place, as shown below. You lock the legs into a low or high position, or leave them flat.

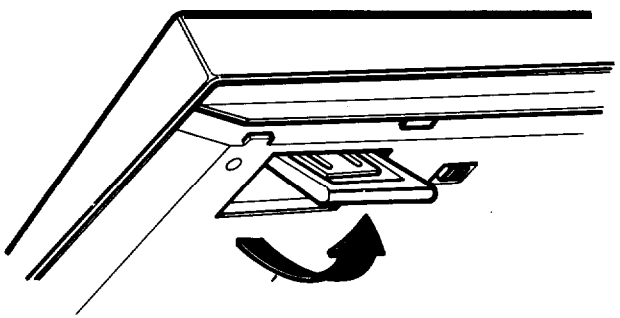


Figure 1-7. Adjusting the Keyboard Angle

7 Turning On the Computer

Before you turn on your computer, read the following safety rules to avoide accidentally damaging the computer or injuring yourself:

- ❑ Do not unplug cables from the computer when the power switch is on.
- ❑ Never turn off or reset your computer while a disk drive light is on. This can destroy data stored on disk or make an entire disk unusable. Similary, never remove a diskette from a diskette drive while the drive light is on.
- ❑ Always wait at least five seconds after you switch off the power before you switch it on again. Turning the power off and on rapidly can damage the computer's circuitry.
- ❑ Do not leave a beverage on top of or next to your system or any of its components. Spilled liquid can damage the circuitry of your equipment.
- ❑ Do not attempt to dismantle any part of the computer. Only remove the cover to install and remove optional devices.

Note
If you ever have to remove the main system unit cover, observe the following precautions:

- **The power supply cord must be unplugged before the main system unit cover is removed (Separe le cordon d'alimentation et puis enleve le couvercle.)**
- **Once removed, the cover must be replaced and screwed in position before the power supply cord is plugged back in. (Apres le couvercle a enleve, visse le couvercle en place et remettre le cordon d'alimentation.)**

Follow these steps to turn on your system:

1. Turn on the monitor, printer, and any other peripheral devices connected to the computer.

2. To turn on the computer, press the power switch.

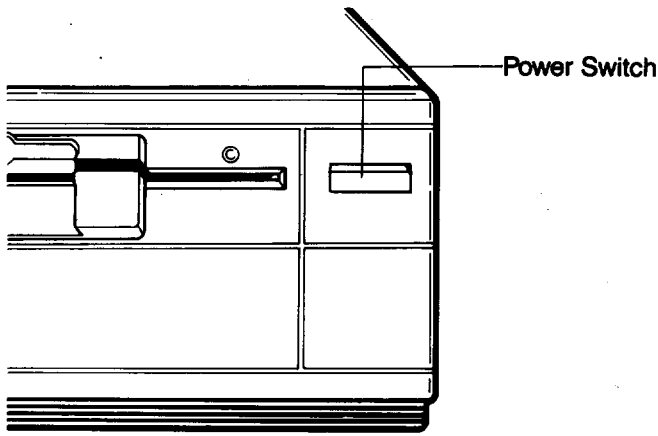


Figure 1-8. Power Switch

The power indicator on the front panel lights up. After a few seconds, the computer starts to perform an internal self test. This is a series of checks the computer completes each time you turn it on to make sure everything is working correctly. If anything is wrong, an error message appears on the screen.

After the self test is complete, you see a message on the screen smiliar to this:

```
388-BIOS (C) 1989 American Megatrends Inc.
         (C) 1989 TriGem Computer Inc.

XXXX KB OK

Press <ESC> to bypass MEMORY test

SIZING CACHE MEMORY, 32KB FOUND
TESTING CACHE MEMORY, 32KB OK
CACHE TEST COMPLETED



(C) American Megatrends Inc,.
DVSX-6080-060290-KB
```

The computer continually updates this display as it tests its memory. This test takes about 1.5 seconds to complete.

You may see a message similar to this:

```
CMOS system options not set

RUN SETUP UTILITY
Press <F1> to RESUME
```

This means that the computer is not yet set up for the equipment you have installed and you must run the Setup program, described in Chapter 2. For now, press the Fl key on the upper left comer of the keyboard to acknowledge the message and continue.

If you cannot see the screen display clearly, use the controls on you monitor to adjust the brightness and contrast until characters on the screen are clear and bright.

The computer then loads MS-DOS, the operating system, from the hard disk into memory. MS-DOS must be in the computer's memory before you can run any program, such as a word processing program or a spreadsheet program.

The Command Prompt

After the computer has loaded MS-DOS from the hard disk, you see the MS-DOS command prompt on the screen:

```
C>
```

The command prompt tells you that your computer is ready to receive instructions. It also identifies the current operating drive: A or C, for example. The command prompt appears on the screen whenever you load MS-DOS, complete an MS-DOS command, or exit an application.

In your computer, the diskette drive is A and the hard disk is drive C. If you have an optional second diskette drive, MS-DOS identifies it as B.

8 Copying System Diskettes

Now that you have started your system and loaded MS-DOS, it is important that you make copies of your MS-DOS diskettes right away. Use the copies (called working copies) as they are needed and store the originals in a safe place.

Each of the system diskettes is formatted for 1.2MB. (Formatting prepares a diskette to store data and is described in Chapter 3 and Chapter 5.)
To copy them, you need eleven 1.2MB highdensity, 51/4inch diskettes.

Note
If you do not have any 1.2MB diskettes, you can use unformatted 360KB diskettes. When copying from 1.2MB diskettes, the DISKCOPY program formats the 360KB diskettes for 1.2MB.

Follow these steps:

1. The C > prompt should be on the screen. If not, type C: and press Enter.

2. Type the following and press Enter:

```
DISKCOPY A: A:
```

   The screen displays this message:

```
Insert SOURCE diskette in drive A:
Press any key to continue...
```

3. Insert the MS-DOS diskette in drive A, as shown below. Hold the diskette with the label facing up and the read/write slot into the drive.

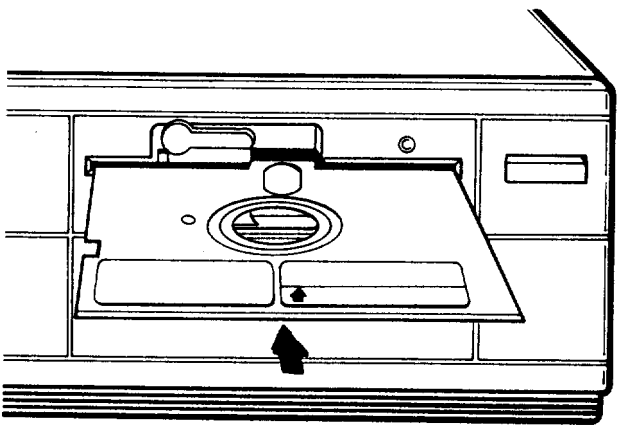


Figure 1-9. Inserting a Floppy Disk

4. Press any key. The DISKCOPY program copies the contents of the MS-DOS diskette to the computer's memory, and then you see the following:

```
Insert TARGET diskette in drive A:
Press any key to continue...
```

If the diskette is not formatted, the DISKCOPY program formats it. Then the program begins copying the data from the computer's memory to the formatted diskette. When the copy is complete, you see this prompt:

```
Copy another diskette (Y/N)?
```

5. Remove the MS-DOS diskette and insert a blank diskette (which is to be the target diskette) in drive A. Then press any key.

6. Press Y so you can make a copy of another MS-DOS diskette. Again, you see the prompt to insert the source diskette.

7. Remove the copy of the MS-DOS diskette which you just made and insert the another MS-DOS diskette into drive A. Then press any key. Follow the prompts on the screen to make a copy of this diskette as you did for the first MS-DOS diskette.

8. When you finish copying the last diskette and the

```
Copy another diskette (Y/N)?
```

prompt appears, press N to return to the MS-DOS command prompt C > .

After you have copied the MS-DOS diskettes, be sure to label them carefully so you know which one is which. Write on the

labels before you attach them to the diskettes in order to prevent damaging the diskettes. Store the originals in a safe place and use the copies as they needed.

9 Resetting Your Computer

If your computer system should "lockup", it may be necessary to reset the computer. Resetting the computer causes the CPU to clear its instruction set and the system memory. This ensures there is no "garbage" left in memory to interfere with new program information.

There are two basic ways to reset your computer. They are:

CONTROL-ALT-DEL (Keyboard Reset)

Press the CONTROL key and the ALT key at the same time. While holding these keys down, press the DELETE key, then release all three keys. This will reset your computer without running the full self-test diagnostics.

The POWER Switch

Turn the main system POWER switch off, wait ten seconds, then turn it back on. The computer will then run the complete self-test diagonistic routine.

Caution!
Any time you RESET your computer, the memory will be cleared. This will erase any software programs loaded into the system RAM. You may lose important data or have problems using your software after the system re-boots. Only RESET your system if you are sure that all of your data has been: saved to disk, or is is no other way escape a "lockup condition,

You should now be able to reset your computer if you run into trouble. At this point, you can complete the installation of your system by running the SETUP program. For detailed information on the SETUP program, see the following chapter.

Chapter 2

The CMOS Setup Program

Introduction

The Setup program keeps a record of the host computer's system parameters (such as memory amounts, disk drives, video displays, and numeric coprocessors). Setup resides in the Read Only Memory Basic Input/Output System (ROM BIOS) so that it is available each time the host is turned on. Setup stores the information in the complementary metal oxide semiconductor (CMOS) memory. When the host is turned off, a back-up battery retains system parameters in the CMOS memory.

As soon as the host is turned on, the power-on diagnostics routines check memory, attempt to prepare peripheral devices for action, and offer you the option of pressing <DEL> to run Setup.

When to Run Setup

During normal daily operation, you do not have to run Setup when you start the host computer.

Under the abnormal conditions, an appropriate message displays, advising you to run the Setup program. These conditions indicate that an error has occurred during the power-on self-tests (POSTs).

Note

Note that you can bypass the memory test by pressing the < ESC > key. This option would be useful when the memory on the system is quite large. You should hit the <ESC> key when the following message appears on the screen.

```
Press <ESC> to bypass MEMORY test
```

Using Setup

Immediately after the memory test, you will get the following prompt on the screen depending upon the type of BIOS you have:

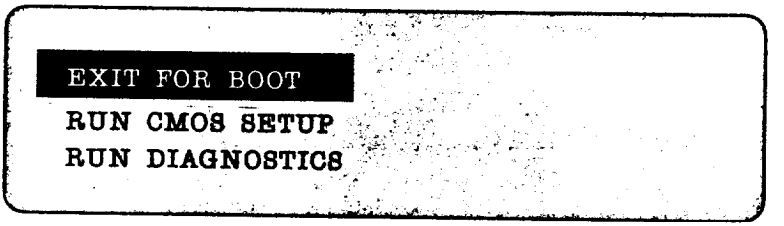
```
Press <DEL> if you want to run SETUP or DIAGS
```

Hit <DEL > key to get into the Setup Mode

Note

<DEL > key will get you into the setup mode, only when the above message is displayed on the screen.

If you hit < DEL > key, a menu appears on the screen giving you the option of



Use <Up ↑ > and <Down ↓ > keys to set the reverse video cursor on the option you want to select and use < Enter > to get into the option.

Note

If your system's start-up message does not show any errors and proceeds to try to load software from the floppy disk drive, you see the following message:

```
DRIVE NOT READY ERROR
Insert BOOT diskette in A:
Press any key when ready
```

This means that the SETUP program options have been set at the factory. Since there were no errors detected, the computer tried to load MS-DOS from the floppy disk drive, before you have inserted the MS-DOS main system diskette. For now ignore this message.

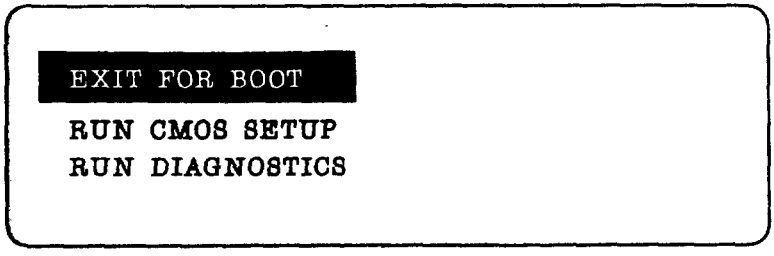
If you want to run the "DIAGNOSTICS" program, see Appendix E for the detailed description of it.

Entering SETUP

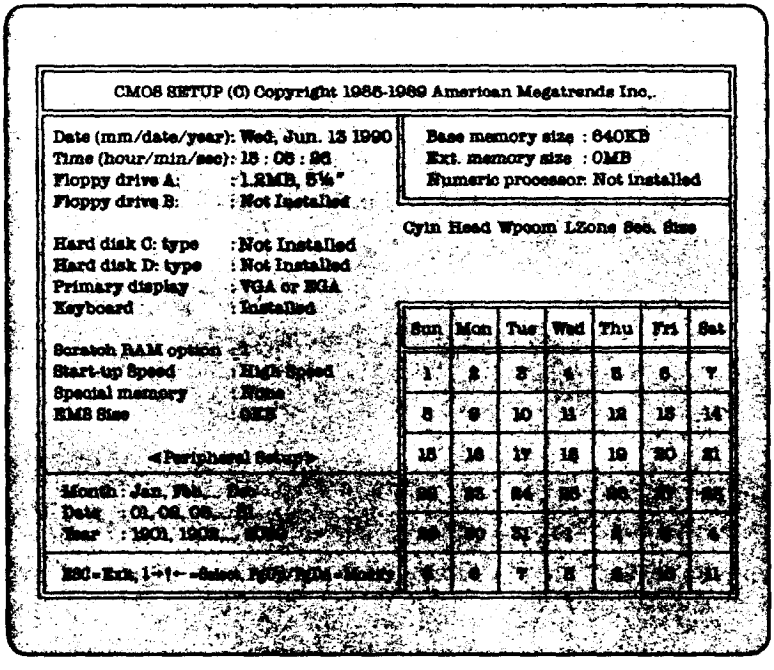
To enter the setup program, hit < DEL > key at the time the following prompt is displayed on the screen immediately after the memory test.

```
Press <DEL> if you want to run SETUP or DIAGS
```

If you hit <DEL> key, you will see a menu like as following.



Set the reverse video cursor on the "RUN CMOS SETUP" using <Up ↑ > and < Down ↓ > and press <ENTER>. Then the screen will be replaced by the following.


CMOS SETUP (C) Copyright 1985-1989 American Megatrends Inc.
Date (mm/date/year): Wed, Jun. 13 1990
Time (hour/min/sec): 15 : 06 : 26
Floppy drive A: : 1.2MB, 5¼"
Floppy drive B: : Not Installed
Hard disk C: type : Not Installed
Hard disk D: type : Not Installed
Primary display : VGA or EGA
Keyboard : Installed
Scratch RAM option :
Start-up Speed : High Speed
Special memory : None
EMS Size : 0KB
<Peripheral Setup>
Month : Jan, Feb...
Date : 01, 02, 03...
Year : 1901, 1902...
ESC=Exit, ↑↓←→=Select, PgUp/PgDn=Modify
Base memory size : 640KB
Ext. memory size : 0MB
Numeric processor: Not installed
Cyln Head Wpcom LZone Sec. Size
Sun Mon Tue Wed Thu Fri Sat
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
27 28 29 30 31

This screen is the SETUP MENU. 'This lists the parameters you can change with the SETUP program. A solid cursor bar highlights the parameter currently available to be changed. You can use the following key conventions.

< Enter > ..... moves the selection bar
< ← > < → > ..... moves the selection bar
< PgUp > < PgDn > ..... scrolls allowable settings
<ESC> ..... exit and save CMOS register
< Ctrl > < Alt > < Del > ... exit without save

Parameters

❑ Date and Time Setup

The first entry in the Setup screen is current date. A calendar has been provided for the user to facilitate him in this procedure. Again, simply press the < PgUp > or < PgDn > keys to select the appropriate value for the month, date and year.

The procedure for setting the time is similar to that of setting the date. The time here is 24-hour time so don't be alarmed when hour 13 shows up on the screen. Simply highlight either the hours, minutes, or the seconds and press the <PgUp >/ < PgDn > keys to step through the numbers.

❑ Floppy Disk Drive Setup

Drives a: and/or b: may be one of the following types:

Allowable Drive Types	
360KB	*51/4"*
1.2MB	*51/4"*
720KB	*31/2"*
1.44KB	*31/2"*
not installed	

❑ Hard Disk Drive Setup

Drives c: and d: are the hard disk drives in the system. 46 drive types have been defined by AMI. If for some reason or other your particular drive is not one of the 46 pre-defined types, simply scroll down to type 47 and enter the following drive specifications: cylinders, heads, WPcom, LZone, and sectors. Please consult the documentation received with the drive for the specific values that will give you optimum performance.

❑ Display Type Setup

The next option is primary display selection. The options are as follows:

Type of Display Allowed
Monochrome
Color 40 x 25
Color 80 x 25
VGA or EGA
Not Installed

❑ Keyboard Setup

The keyboard Setup is the next option for the user. You may either choose to enable or disable the Keyboard test during Power On Self Test by setting keyboard as "Installed" or "Not Installed".

❑ Scratch RAM Option.

The next option is the setting of the scratch RAM. The purpose of this element is to

(1) Save the user definable drive type 47
(2) Translate 80386 Loadall function for programs like OS/2, RAMDRIVE etc.

If Shadow RAM is not enabled, the parameters of the drive must be stored in normal RAM, but the integrity of the data must be maintained. The options you have are the following:

1. The BIOS to use 100 bytes at 30h:0
2. The BIOS to reduce the size of the base memory by 1KB.

The default is 1. If you are not using Drive type 47 or not running programs like OS/2, RAMDRIVE this RAM will never be used by so you may leave the value as 1.

❑ start-up speed

This parameter is used to select the system's default speed. The options are:

- High speed
  Under this option, your system is initially booting with 20MHz CPU speed when you turn the power on.

- Low speed
  Select this option is to boot your system with 6MHz CPU speed as turning the power on.

00 Special Memory

This parameter is used to boost your system's performance by loading the BIOS and/or VIDEO controller code into the RAM space between 640K and lM-byte. The options are:

- None
  Select this option is you are not going to use shadow RAM.

- BIOS
  Use this parameter to copy the system BIOS into shadow RAM during the start-up routine.

- Video
  This parameter loads the program code from your video card into shadow RAM during system start up.

- BIOS + Video
  This option loads the BIOS and video code into shadow RAM.

- Ext. Memory
  If you use the extended memory on your system, select this option. The Ext. Memory size is determined according to the EMS Size and displays on the upper right comer of the Setup message.

- EMS Memory
  You can use the EMS memory using this option.

Note
You can use the last two options at this parameter only when you have 1MB on board memory with your system.

❑ EMS Size

The options available are used to describe how your system will use the EMS memory above lM-byte, as follows:

- The EMS memory size is preset according to the on board memory size. If you want to use EMS memory, you should select the EMS memory size you are using in this option.

❑ Peripheral Setup

When you scroll down to this parameter, the following message will be displayed on the right side of the Setup message.

Peripheral Setup

Serial 1: Enabled
Serial 2: Enabled
Parallel: Enabled
FDC: Enabled
HDC: Enabled

- Serial 1
  If you'd like to the on board serial port 1 for COM 1, set this option "Enable". But, when you install the external card to use another serial port for COM 1, you should select "Disable" on this option to disable the on board serial port.

- Serial 2
  Set this option "Enable" if you want to use the on board serial port 2 for COM2. Like as serial 1, you should also disable this option when you install the external card to use another serial port for COM2.

Note
Although you need only the on board serial 2 port for COM2, do not disable the serial 1. If you disable serial 1 and enable aerial 2 when you don't have any external I/0 adapter, the serial 2 automatically set to CDM1.

- Parallel
  If you use on board parallel port, enable this option. However if you want to use another parallel port using external I/O card, you should disable this option.

- FDC

  Your system provide on board FDC and it supports two floppy disk drive to your system. If you use another FDC in your system using external Card, you should disable this option.

- HDC

  The system has on bord IDE type HDC. If you'd like to another type of HDC (for example, SCSI, or ESDI etc.), disable this option and install your HDC Card to the expansion slot on the backplane board.

Leaving the Setup Program

When you have completed the changes, press the < ESC > key. The SETUP program will display the message:

```
Write data into CMOS and exit (Y/N)?
```

If you have made any mistakes, press N for No, then move the cursor back up to the beginning and verify each parameter, making any corrections necessary. When you are satisfied with the option settings, press the <ESC> key, then press Y to write the new settings into the configuration RAM. Your computer will run through the self test diagnostics again and try to read a diskette in the first floppy disk drive.

As mentioned above, you may see an error message if you don't have a system diskette inserted into the floppy disk drive.

Chapter 3

Using Your Computer

This chapter covers the following basic procedure for using your computer:

00 Changing the operating speed

00 Using special keys on the keyboard

❑ Stopping a command or program

00 Using disks and disk drives.

Changing the Operating Speed

Your computer can operate two speeds; 8MHz or 20MHz. At 20MHz, the computer performs all tasks faster, and almost all programs may be run at 20MHz. However, some option cards and application programs require the lower speed. See your option card or application program manual to make sure that you can use the higher speed before selecting it.

Keyboard Method

The following keystroke sequences can be used to set the processor clock speed.

- Ctrl-Alt- < - > Hold down the < Ctrl > and < Alt > keys and press < - > on the numeric keypad to place the system in low speed mode.

- Ctrl-Alt- < + > Hold down the < Ctrl > and < Alt > keys and press < + > on the numeric keypad to place the system in high speed.

Changing the operating speed may be performed with the TriGem Utility TGSS.COM. This program is located on the MS-DOS diskette supplied with the system. You can find the detailed description of TGSS.COM in your MS-DOS User's Guide.

Special Keys on your Keyboard

Certain keys on your keyboard serve special functions when your computer is running programs. The illustration below shows the TriGem keyboard, and the table that follows describes the special keys.

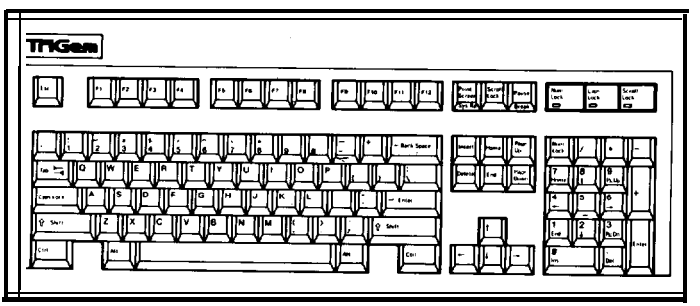


Figure 3-1. Keyboard (101 key)

Key	Purpose
F1-F12	Perform special functions within application program (Some keys also function with MS-DOS. See your MS-DOS Reference Manual for more information.)
Tab	Moves the cursor one table to the right in normal mode (and one tab the left in shift mode when using some application programs.)
Ctrl	Works with other key to perform special (control) function, such as editing operations.
Shift	Produces uppercase characters or the top symbols on the keys when used with the main character keys. Produces lowercase characters when Caps Lock is on.
Alt	Works with other keys to enter alternate character codes or functions.
Backspace (-)	Moves the cursor back one space, deleting the character to the left of the cursor
Enter	Ends a line of keyboard input or executes a command (may be called the Return key in some application program manuals).
Caps Lock	Changes the letter keys from lower-to uppercase; changes back to lowercase when pressed again. The numeric/symbol keys on the top row of the keyboard are not affected.
Esc	Cancels the current command line or operation in MS-DOS. Esc can also have special uses in application programs.
Num Lock	Changes the function of the keys on the numeric/cursor keypad from numeric entry to cursor positioning; changes back when pressed again.
Scroll Lock	Controls scrolling in some application programs.
Break	When pressed with the Ctrl key (hold down Ctrl and press Break), sends a break signal to the computer to terminate the current operation.

Key	Purpose
SYS Req	Produces the system request function in certain applications.
PrtSc	Prints the screen display on a dot-matrix printer
Home, End, PgUp, PgDn ←↑→↓	Control cursor location in some applications, such as word processors, game programs, and spreadsheets.
Ins	Turns the insert function on and off in some application programs.
Del	Deletes the character at the cursor position.

The Num Lock, Scroll Lock, and Caps Lock keys work as toggles; press the key once to turn on a function and again to turn it off. When the function is enabled, the corresponding light on the top right comer of the keyboard is on. When the function is disabled, the light is off.

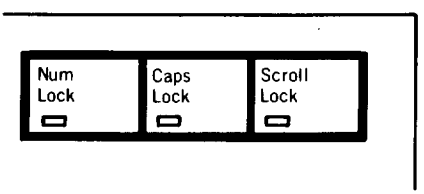


Figure 3-2. Keyboard LED

Stopping a Command or Program

You may sometimes need to stop a command or program while it is running. Many application programs provide a command you can use to stop or even cancel (undo) an operation. If you have entered an MS-DOS command that you want to stop, try one of the following commands:

- ❑ Hold down the Ctrl key and press C
- ❑ Hold down the Ctrl key and press Break

These methods may also work in your application program. If you cannot stop a particular operation, however, you may need to reset the computer, as described in the following section.

> caution!
> It is best not to run off the computer to stop a program or command. If you have created new data that you have not yet stored, it will be erased if you turn off the computer. Your computer stores data in its memory until you save it; but the memory area is erased each time you turn off or. reset the computer.

Using Disks and Disk Drives

The disk drives in your computer allow you to store data on disk and retrieve it when you want it.

This section explains how disks work and tells you how to do the following:

- ❑ Choose diskettes

- ❑ Care for your diskettes and diskette drives
- ❑ Insert and remove diskettes
- ❑ Write-protect diskettes
- ❑ Make backup copies of your diskettes
- ❑ Use a single diskette drive
- ❑ Use a hard disk drive

How Disks Store Data

The diskette you insert in your computer's diskette drive is made of flexible plastic, coated with magnetic material. It is enclosed in a square jacket. Your computer stores data on the diskette by recording on the magnetic surface.

Unlike a diskette, a hard disk is rigid and fixed in place. It is sealed in a protective case to keep it free from dust and dirt. A hard disk stores data the same way that a diskette does, but it works faster and has much larger storage capacity.

All disks are divided into data storage compartments by sides, tracks, and sectors. Double-sided diskettes - like the ones you use in your computer - store data on both sides. On your disk there are concentric rings, called tracks, in which a disk can store data. Double-density diskettes (such as 360KB diskettes) have 40 tracks, and high-density diskettes (such as 1.2MB or 1.44MB diskettes) have 80 tracks. But 720KB double density diskette has 80 tracks.

A hard disk consists of two or more magnetically-coated platters stacked on top of one another, so it has four or more sides with many more tracks than a diskette.

A disk is further divided by sectors. To understand what a sector is, picture the spokes on a bicycle wheel radiating from the center of the wheel to the tire. The space between one spoke and the next is like a sector on a diskette. (See the figure below.) Each track on a 1.2MB diskette has 15 sectors, and each sector holds 512 bytes.

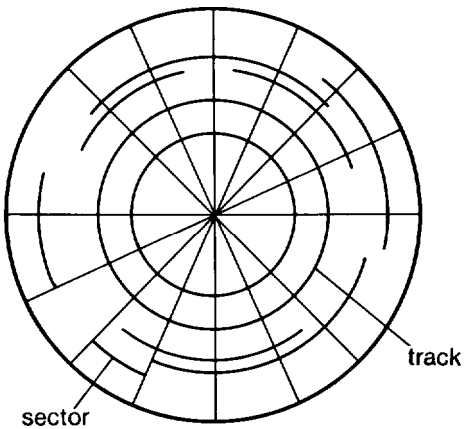


Figure 3-3. Sectors and Tracks

Your computer uses the read/write heads in a disk drive to store and retrieve data on a disk. There is one head above the diskette and one below, so the drive can write to both sides of the diskette. To write to a disk, the computer spins it in the drive to a position where one of the read/write heads can access the diskette through the read/write slot. The read/write slot on a diskette exposes the diskette's magnetic surface so the read/write head can write on the appropriate area.

Because data is stored magnetically, you can retrieve it, record over it, and erase it - just as you play, record, and erase music on a cassette tape.

Types of Diskette Drives

You computer has at least one 1.2MB diskette drive. With this drive, use 51/4+inch, double-sided, high-density, 96 TPI, 1.2MB diskettes. These diskettes contain 80 tracks per side, 15 sectors per track, and hold up to 1.2MB of information, which is approximately 500 pages of text. You can also format these diskettes for 360KB - see your MS-DOS Reference Manual for more information.

In addition, you may have a diskette drive of a different type. The following list describes the types of optional diskette drives you can use in your computer and which diskettes you should use with them:

- 360KB drive - With this drive, use 51/4-inch, double-sided, doubledensity, 48 TPI (tracks per inch), 360KB diskettes. (You can also use single-sided, 160KB or 180KB diskettes). These diskettes contain 40 tracks per side, 8 or 9 sectors per track, and hold up to 360KB of information, which is approximately 150 pages of text. (With 8 sectors per track, a diskette holds up to 320KB.)

- 720KB drive - With this drive, use 3l/2-inch, double-sided, double-density, 135 TPI, 720KB diskettes. These diskettes contain 80 tracks per side, 9 sectors per track, and hold up to 720KB of information - approximately 300 pages of text.

- 1.44MB drive - With this drive, use 3l/2-inch, double-sided, highdensity, 135 TPI, 1.44MB diskettes. These diskettes contain 80 tracks per side, 18 sectors per track, and hold up to 1.44MB of information, which is approximately 600 pages of text.

If your computer has more than one type of these drives or if you use diskettes from other computers, you need to be aware of certain incompatibilities between the drives and the diskettes they use.

Note
You must format new diskettes before you can use them with an operating system. Formatting erases all the data on a diskette and prepares it to receive new data, so be sure to format only new blank diskettes or diskettes that contain data you want to erase. See Chapter 5 for instructions on formatting diskettes.

Drive and diskette incompatibilities

Because of the size difference, you cannot use 31/2-inch diskettes in a 51/4-inch drive or vice versa. There are also certain limitations on using diskettes that are the same size as the drive but have different capacities. The following tables summarize the possiblities and limitations.

5l/4-inch drive/diskette compatibility

Drive type	Diskette types it can read from and write to
360KB	180KB, or 360KB
1.2MB	180KB, 360KB, or 1.2MB

31/2-inch drive/diskette compatibility

Drive type	Diskette types it can read from and write to
720KB	720KB
1.44MB	720KB, or 1.44MB

Warning
If you write to a 360KB (or 180KB) diskette while it is in a 1.2MB drive, you may not be able to read it or write to it in a 360KB drive later.

Because of these incompatibilities, you should indicate the density and diskette type when you label your diskettes. (Usually this information appears on the manufacturer's label.)

If you have any combination of the above drives (360KB, 1.2MB, 720KB, or l.44MB), you can copy files from one drive to another - using the COPY or XCOPY command - as long as the correct diskette type is in each drive. You can use these commands to copy files between the hard disk and any type of diskette. You cannot use the DISKCOPY to copy from one drive to another if the two drives are not the same type.

Caring for Diskettes and Diskette Drives

Follow these basic precautions to protect your diskette and avoid losing data:

- ❑ Do not remove a diskette from the diskette drive or turn off the computer while the drive light is on. This light indicates that the computer is copying data to or from a diskette. If you interrupt this process, you can destroy data.
- ❑ Remove all diskettes before you turn off the computer.
- ❑ Keep diskettes away from dust and dirt. Small particles of dust or dirt can scratch the magnetic surface and destroy data. Dust can also ruin the read/write heads in a diskette drive.
- ❑ Never wipe, brush, or try to clean diskettes in any way.
- ❑ Keep diskettes in a moderate environment. They work best at normal room temperature and in normal humidity. Do not leave your diskettes sitting in the sun, or in extreme cold or heat.

- Keep diskettes away from magnetic fields. (Remember that diskettes store information magnetically.) There are many sources of magnetism in your home or office, such as electrical appliances, telephones, and loudspeakers.

- Do not place diskettes on top of your monitor or near an external disk drive.

- Never touch a diskette's magnetic surface. The oils on your fingertips can damage it. Always hold a diskette by its protective jacket. If you are using a 31/2-inch diskette, do not slide the metal shutter; this exposes the diskette's surface.

- Do not place anything on top of your diskettes and be sure they do not get bent. A diskette does not rotate properly in the drive if it has been damaged.

- Carefully label your diskettes. Attach labels firmly but gently, and only along the top of a diskette (next to the manufacturer's label). Do not stick several labels on top of one another-too many labels can make it difficult to insert the diskette into the drive.

- It is best to write on the label before you attach it to the diskette. If you need to write on a label that is already on a diskette, use only a soft-tip pen, not a ballpoint pen or a pencil. Always indicate the storage capacity and density type on the label.

- Store diskettes in a proper location, such as a diskette container. Do not store diskettes flat or stack them on top of each other. When you are not using them, keep your diskettes in their protective envelopes.

Follow these additional precautions to protect your hard disk drive and its data:

- ❑ Never turn off the computer when the hard disk drive light is on. This light indicates that the computer is copying data to or from the hard disk. If you interrupt this process, you can lose data.

- ❑ Never attempt to open the hard disk drive. The disk itself is enclosed in a sealed container to protect it from dust.

Inserting and Removing Diskettes

To insert a diskette into the drive, hold it with the label facing up and the read/write slot leading into the drive, as shown below.

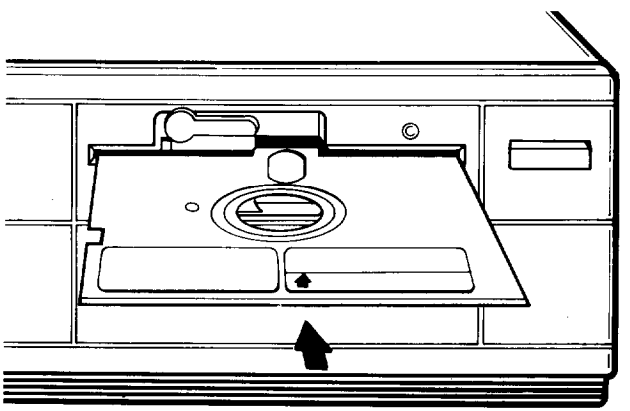


Figure 3-4. Inserting a Diskette (5 1/4")

Slide the diskette into the slot until it is in all the way. Then turn the drive latch down to lock it in a vertical position. This keeps the diskette in place and enables the read/write heads in the diskette drive to access the diskette.

If a diskette is in the drive but the latch is up (horizontal) and you enter a command for that drive, the computer cannot tell there is a diskette in the drive and displays an error message such as:

```
Not ready error reading drive A
Abort, Retry, Fail?
```

Close the latch and press R.

To remove the diskette, turn the drive latch up until it is horizontal and the edge of the diskette pops out. Carefully pull out the diskette, place it in its protective envelope, and store it in a proper location, such as a diskette container.

If you have an optional 31/2-inch diskette drive, insert the diskette with the label facing up and the metal shutter leading into the drive, as shown below. Slide the diskette into the drive until it clicks into place.

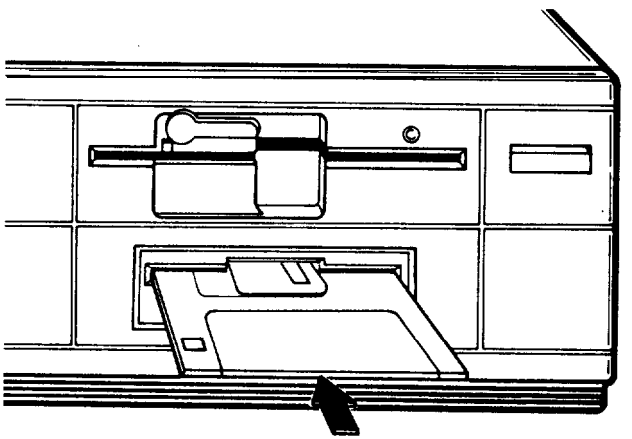


Figure 3-5. Inserting a Diskette (3^{1}/2″)

To remove a 3′/2-inch diskette, press the release button to release it. When the edge pops out of the drive, pull out the diskette and store it properly.

warning
Never remove a diskette or turn off the computer while the drive indicator light is on. You could lose data, Also be sure to remove all diskettes before you turn off the computer.

Write-protecting Diskettes

You can write-protect a diskette to prevent its data from being altered. When a diskette is write-protected, you can read it and copy data from it, but you cannot store new data on the diskette or delete any files it contains. If you try to change data stored on a write-protected diskette, MS-DOS displays an error message.

To write-protect a 51/4-inch diskette, cover the small, rectangular notch (shown below) with an adhesive write-protect tab. Write-protect tabs usually come with new 51/2inch diskettes when you buy them.

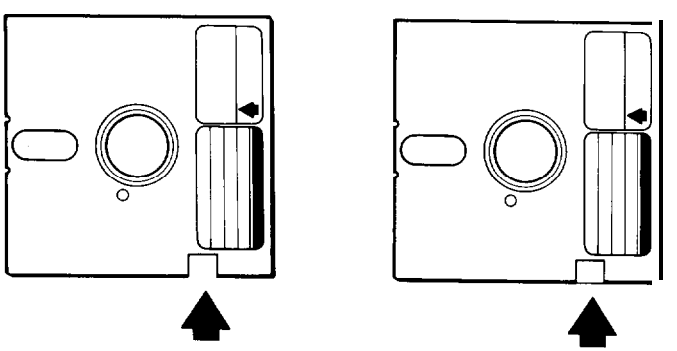


Figure 3-6. 5′/4″ Diskettes & Write-Protect Tab

Note
Some program diskettes, such as your MS-DOS diskettes, have no notch so they any permanently write-protected. This protects them from being accidentally erased or altered.

On a 31/2inch diskette, the write-protect device is a small switch on the lower-right comer on the back, shown below. To write-protect a 3l/2-inch diskette, slide the switch toward the edge of the diskette until it clicks into position, exposing a hole in the comer.

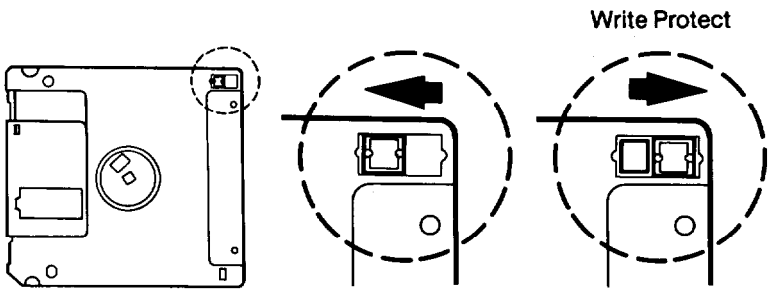


Figure 3-7. 3′/2″ Diskette & Write-Protect SW

To remove the write protection, slide the switch toward the center of the diskette so the hole is covered.

Making Backup Copies

It is important to make copies of all your data and system diskettes. Copy all diskettes that contain programs, such as the original MS-DOS diskettes that come with your computer, and use only the copies. Store your original MS-DOS diskettes in a

safe place away from your working copies. Backup your data diskettes regularly, whenever you revise them, to keep them up-todate, and store them away from your originals.

Chapter 1 describes how to use DISKCOPY to copy your MS-DOS diskette. For more detailed information to make backups of other diskettes, refer to Chapter 4 "Using MS-DOS with your computer".

It is best to put most of the programs and data files you use regularly on the hard disk. Keep backup copies of all your program files on diskettes, however, and regularly copy important data files to diskettes as well.

Using a Single Diskette Drive

The operating system expects the computer to have at least two diskette drives, and it displays prompts and messages accordingly. If the computer has only one diskette drive, MS-DOS treats the one drive like two logical drives. This helps you perform operations that normally require two diskette drives.

Usually, MS-DOS recognizes the first diskette drive (the top drive) as drive A and the second diskette drive as drive B. If you have only one diskette drive, MS-DOS recognizes it as both A and B.

For example, if you give a command to copy from A to B, MS-DOS copies data from the diskette you place in the single drive (A) to the computer's memory. Then MS-DOS automatically prompts you to insert another diskette in the same drive, which it now identifies as drive B. It copies the data from memory to the new diskette. When the copying is complete, MS-DOS identifies the drive as drive A again, and you see a prompt to insert the original diskette into drive A.

You can load the opeating system and application programs from the hard disk, create and store your data there, and use the diskette drive just for copying data to and from diskettes.

> **Note**
> If you only have one diskette drive and no hard disk, you need to use that drive to load the operating system as well as the application programs you are using. First load the operating system; this copies it into the computer's memory (RAM) so you do not need to leave the diskette in the drive. Then you can remove that diskette and insert the program diskette you want to use, and load that into memory too. See your application program manual for detailed instructions.

Using the Hard Disk Drive

You can create and revise files on a hard disk just as you can on a diskette. The hard disk, however, provides several advantages:

- The 20MB hard disk can store more data than 16x 1.2MB diskettes and the 40MB hard disk can store twice as much.
- Your computer can perform all disk-related operations faster.
- You can store all your frequency used programs and data files on the hard disk, eliminating the inconvenience of inserting and removing diskettes to access different files.

The added storage capacity makes it easy to move back and forth between different programs and data files. However, because it is so easy to add programs and files to your hard disk, you may find yourself trying to organize hundreds of files.

MS-DOS lets you keep related files together in directories and subdirectories so they are easier to find and use.

Backing up hard disk Ales

While the hard disk is very reliable, it is essential to back up your hard disk files to diskettes in case you lose some data accidentally. Make copies of all your system and application program diskettes before copying the programs to the hard disk. After you create data files on the hard disk, be sure to copy them to diskettes whenever you revise them to keep your backup diskettes up-todate.

You can see the more detailed information of backing up hard disk files on the Chapter 6.

Preparing the hard disk for moving

Before you move the computer, you need to secure the read/write heads inside the hard disk drive. Securing the read/write heads moves them to a region of the disk surface that does not contain data, and locks them in position. This prevents the disk from being damaged if it is bumped accidentally.

To secure the read/write heads for moving, run the TGSHIP program. Follow these steps to run TGSHIP:

1. Exit any program you are using so the MS-DOS command prompt is on the screen.

2. Insert the MS-DOS diskette in drive A.

3. Type the following and press Enter:

You see a message on the screen that tells you the disk drive's read/write heads will remain locked until you reset the computer or turn the power off and on again. The computer locks the heads and disables the keyboard. You can now turn off the computer and prepare to move it to the new location.

The TGSHIP command should be run whenever you are going to move the main system unit. This command moves the read/write heads inside the hard disk drive to a "safety zone," where they won't accidentally scratch the surface of the drive platters. TGSHIP.COM is a special DOS command file included with your system. You should copy this file into the root directory of your hard disk drive.
See MS-DOS reference manual for more information of TGSHIP command.

Chapter 4

Using MS-DOS With Your Computer

Once you have your computer system "up-and-running," you may begin to work with MS-DOS.

Virtually all application software available for IBM PCiXT and PC/AT-compatible computer systems runs "under" MS-DOS. Therefore, in order to use these programs, you need to learn how to use MS-DOS. This chapter will give you a basic understanding of MS-DOS and provide you with the basic tools you need run application software on your computer system. For more detailed explanation of the MS-DOS operating system, see your MS-DOS USER'S GUIDE.

MS-DOS is an acronym for Microsoft Disk Operating System. The disk operating system is a collection of programs that allow you to control all the elements of your computer. When booting up, the MS-DOS command file is copied from the MS-DOS main disk into your computer's memory. From there, it controls the rest of the system.

During a normal operating session, you will want your computer system to boot up in MS-DOS. Before that can happen, however, you may need to install MS-DOS on your system.

If your system does not have a hard disk system, you must perform the installation routine to configure MS-DOS for floppy disk-based operation.

If you do have a hard disk drive, but MS-DOS has not been installed you must perform the installation routine to configure MS-DOS for use on the hard disk system.

For complete instructions on installing MS-DOS, see your MS-DOS User's manual.

Inserting Diskettes

Your MS-DOS software package contains of the following items:

- One MS-DOS Install Diskettes
- One MS-DOS Select Diskette
- Three MS-DOS Operating Diskettes
- One MS-DOS Shell Diskette
- The MS-DOS User's Guide & User's Reference
- The MS-DOS Shell User's Guide

Begin the installation procedure by placing the MS-DOS Install diskette in the A drive and turning your computer on.

Disk Drive Letters

The various disk drives on your computer are assigned letters. As you work with MS-DOS, you will see that these letters are used to identify which drive is to be used at any given time.

The microcomputer industry has standardized the use of letter identification for MS-DOS-type machines as follows:

- The first floppy disk drive is referred to as the "A:" drive.
- The second floppy disk drive is referred to as the "B:" drive.
- The first hard disk drive is referred to as the "C:" drive.

Note
For information on reassigning disk drive letters, refer to sections Regarding the ASSIGN command in your MS-DOS USER'S GUIDE.

To insert a diskette into the drive:

- ❑ Open the drive door
- ❑ If you haven't already done so, remove the protective cardboard insert from the drive.
- ❑ Gently insert the diskette into the drive entry slot with its label facing up, and the write protect notch to the left.
- ❑ When the diskette is all the way in, close the drive door by turning the door latch handle down.

Caution!
If any resistance is felt when closing the drive door, stop and reinsert the diskette.

To remove a diskette from a floppy disk drive:

- ❑ Be sure the drive indicator light is off

Caution !
It is very important that you never remove a diskette from an active drive. Doing so can destroy the information on the diskette. If the computer. system is "locked-up" with the drive indicator light on, RESET the computer before removing the diskette.

- ❑ Turn the door latch to open the drive.
- ❑ Remove the diskette and insert it into its protective envelope.

Starting MS-DOS

To start MS-DOS 4.01 on a floppy disk-based system (that is, one without a hard disk drive), follow these steps given below. For a detailed description of how to start MS-DOS 4.01, consult the Getting Started section in your MS-DOS 4.01 User's Guide.

- ❑ Remove the MS-DOS Install diskette from its protective envelope and insert it into the A drive.
- ❑ Close the disk door and turn your computer on.
- ❑ Remove the Install disk and insert the Select disk.
- ❑ Press ENTER.
- ❑ Remove the Select disk and insert the Install disk.
- ❑ Press ENTER.

The Welcome screen appears. This screen contains information about the number of disks required to install the operating system.

- ❑ Press ENTER

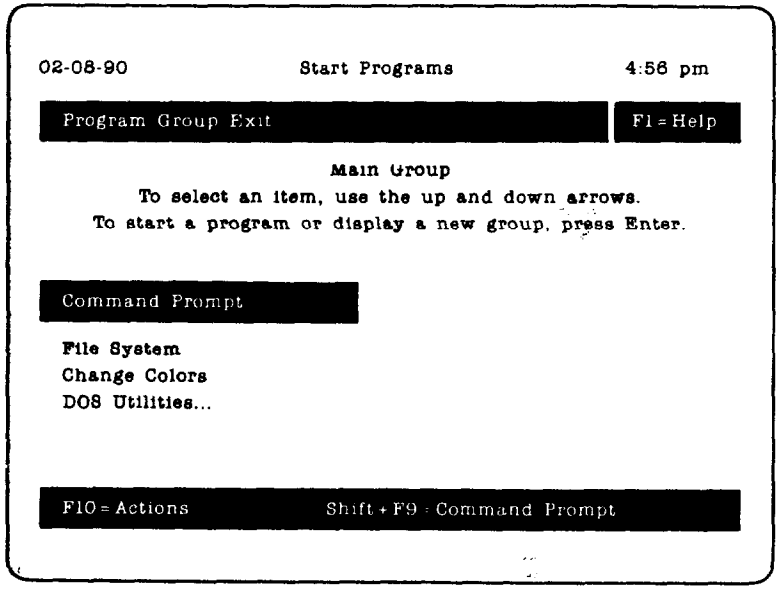
The Introduction screen appears. This screen contains information about the function keys used to run the Select program.

- ❑ Press ENTER

The first screen of the Select program appears. For more information about the Select program, consult the Getting Started section in your MS-DOS 4.01 User's Guide.

If your computer has a hard disk drive, and MS-DOS has been installed, simply turn your system on. Your computer will perform its self-test diagnostics and display the DOS Shell menu screen.

Notice that the words "Command Prompt" are highlighted by a solid bar. This is a DOS Shell option that allows you to work directly with MS-DOS.



Your computer system is now "running under DOS."
For now, press ENTER to run the Command Prompt option.

System Prompt

After you press the ENTER key to either accept the time shown or enter a new one, MS-DOS will show a new prompt on the monitor:

```
Microsoft (R) MS-DOS (R) Version X.XX
          (C) Copyright Microsoft Corp 19XX-19XX

A>
```

This is the system prompt. When it is displayed, it means that MS-DOS is waiting for you to tell it what to do. This is done by typing a DOS command, then pressing the ENTER key.

Cursor

Following the system prompt, you will see a blinking underline (_) character.
This is the "cursor". The cursor shows you where the next character you type will appear on the screen. As you can see here, any command you type will appear immediately to the right of the system prompt and on the same line. Application software often uses the cursor as well, allowing you to use the cursor control keys to move the cursor around on the screen.

MS-DOS Commands

DOS commands instruct your computer to perform tasks such as display a disk directory, copy a file, delete a program, etc. These are called internal commands and can be used anytime after the system has loaded MS-DOS into memory. They do not require the MS-DOS main system diskette to function.

More complex DOS commands are actually separate programs that provide powerful features for your computer. These are called external commands, and perform such tasks as formatting a diskette, comparing files on different disks, backing up a hard disk, etc. These commands require one or more of the MS-DOS diskettes.

Hard disk system user's can run any DOS command without diskettes because the programs are stored on the hard disk drive.

Case Sensitivity

MS-DOS does not differentiate between upper and lower case letters in commands and filenames. This manual will show commands in upper case for clarity, but you may enter them either way. For example, both of these commands will generate a directory listing of a diskette:

```
A>DIR
```

and

```
A>dir
```

Function Keys and MS-DOS

As mentioned earlier, MS-DOS uses several of your keyboard's function keys to provide you with shortcuts. When you press the ENTER key after typing a command, MS-DOS copies the command into a "buffer" memory. By using the function keys, you can edit and reuse the command without having to retype the entire line.

- Fl key
Copies one character at a time from the buffer to the command line

- F2 key
Copies the entire buffer up to the next character you type

- F3 key
Copies the entire buffer to the command line

- F4 key
The opposite of F2, deletes all characters from the buffer up to, but not including, the next character you type

- F5 key
Moves the current line you are typing into the buffer without ENTERing it

- F6 key
Places an "end-of-file" marker when you copy from the monitor to a disk file

- ESC key
Cancels the current command line without changing the buffer

- INS key
Inserts characters into the command line as you copy characters from the buffer

- DEL key
Deletes characters from the buffer

BACKSPACE Key

From time to time, you may make a typing error. This is not usually a problem if you correct the error before you ENTER the command. You can use the BACKSPACE key for this purpose.

> Note
> Occasionally, you might happen to enter the wrong command by mistake. If this incorrect command will result in the loss of data, MS-DOS will Usually warn you, and give you a change to change your mind.

The BACKSPACE key on your keyboard works just like a backspace key on a regular typewriter: it moves the cursor back one position. In addition, however, it erases the last character typed. Press the BACKSPACE key as many times as necessary to erase the typing mistake, then type out the command correctly. For instance, type the following (but do not press ENTER):

```
A>DRI
```

Press the BACKSPACE key twice to erase the I and the R.

Retype:

```
A>DIR
```

Then press the ENTER key. Your computer will respond by producing the directory of the disk in the A drive. Now type this:

```
A>DRI
```

Then press the ENTER key. Your computer will respond:

```
Bad command or filename
A>
```

Default Drive

MS-DOS will only look at one disk drive at a time. Normally, this is the "default" drive. You can tell which disk drive is the current default drive by looking at the system prompt.

For example:

```
A>
```

indicates that the "A" drive is currently the default drive. Unless you specify otherwise, MS-DOS will direct any disk activity to the "A" floppy disk drive.

You can easily change the default drive with an internal DOS command. For instance, to change from the "A" drive (floppy disk), to the C drive (hard disk), enter:

```
A>C:
```

The computer will respond:

```
C>
```

As you can see, the system prompt has changed to show the new default drive letter.

Note
If the computer responds:

```
Invalid Drive Specification
```

it may mean that either there is no hard disk system installed, or your hard disk drive has not been configured yet. See Chapter 6, "Using Your Hard Disk," for instructions.

From the A. prompt command, try the command:

```
A > B:
```

The computer will respond:

```
Insert diskette for drive B: and strike any key when ready
```

Press ENTER after you insert the diskette into the drive, then the system prompt will be:

```
B >
```

If you have a dual floppy disk drive system, the second, or "B" drive is now the system default drive, as indicated by the new system prompt. If performed on a single drive computer system, this command will still change the system prompt to B > , even though there is only one physical drive present.
The BIOS "pretends" there are two disk drives present. It routes all commands intended for the B drive back to the A drive.

This feature is intended to allow owners of single drive systems to use application software designed for dual drive systems.

Copying Your MS-DOS Diskettes

The first important task you must complete with your new system is to make a "backup" copy of your MS-DOS diskettes. To do this, you will need seven blank diskettes. It is a good idea to prepare seven diskette labels at this time. Write the following on those diskette labels, using a felt tipped pen:

```
MS-DOS MAIN SYSTEM DISKETTE
BACKUP COPY (Version #)
```

Write down the MS-DOS version number on each diskette labels. This will avoid confusion later if you upgrade your operating system to a new version. As you finish copying and checking each MS-DOS master diskette, peel the correct label off of the backing paper and place it on the upper left-hand side of the front face of the new diskette.

The following procedures will show you how to make backup copies of your MS-DOS master diskettes on both single and dualdrive systems.

Copying on Single Drive systems

MS-DOS uses the external command DISKCOPY to copy entire diskettes. DISKCOMP is used to compare the original and backup diskettes to ensure that the copy is accurate.

To copy your master diskettes, first turn your computer on and boot up MS-DOS. Choose the Command Prompt option from the DOS shell menu. The system prompt will appear.
Enter the following command:

```
A > DISKCOPY
```

The following message will be displayed:

```
Insert SOURCE diskette in drive A:

Press any key to continue...
```

The "SOURCE" diskette is the disk that you will be copying from. Insert the MS-DOS master diskette into the A drive.

Press any key, such as the % SPACEBAR. The floppy disk drive will be activated, and your computer will display:

```
Copying xx tracks
x Sectors/Track, x Side(s)
```

The contents of the disk are being read into your computer's memory. After a few moments, the following message will appear:

```
Insert TARGET diskette in drive A:

Press any key to continue
```

When the drive indicator light goes out, remove the MS-DOS master diskette from the floppy disk drive. Insert a new, blank diskette into the drive. This is the "TARGET" diskette.

Caution!
Make sure the target diskette is blank. If there is any previous data on the diskette, it will be erased by the DISKCOPY routine.

Press the SPACEBAR key. The drive will turn on, indicating that the computer formatting the new diskette, then writing the copied information onto it. After a few moments, the drive will turn off, and the system will display:

```
Copy another diskette (Y/N)?
```

For now, type N. The system prompt will reappear. To compare the backup diskette with the original, you will use the DISKCOMP command. Enter the command at the system prompt:

```
A>DISKCOMP
```

The computer will respond:

```
Insert FIRST diskette in drive A:

Press any key to continue...
```

Remove the backup diskette from the drive, and put it in its protective jacket. Set it aside for a moment, making sure that you don't mix it up with the second blank diskette. Put the original "master" MS-DOS main system diskette back into the floppy disk drive, then press the SPACEBAR key. As with the DISKCOPY command, your computer will read the entire contents of the diskette into system memory, and will display:

```
Comparing xx tracks
x Sectors per Track, x Side(s)
```

When the computer is finished reading, the drive will turn off, and the following message will appear:

```
Insert SECOND diskette in drive A:

Press any key to continue...
```

Remove the master MS-DOS diskette from the floppy disk drive, and put it in its protective envelope. Take out the backup copy diskette, insert it into the disk drive, and press the SPACEBAR key.

The computer will read the contents of the backup diskette, and compare them with the copy of the master diskette that it has stored in memory. If the information on the two diskettes is identical, the computer will respond:

```
Compare OK

Compare another diskette (Y/N)?
```

Type N to return to the system prompt.

If there is a problem with the backup diskette, or if you put the wrong diskette into the drive by mistake, the computer will respond:

```
Compare error on
side x, track x
```

If the computer shows compare errors, start the copying procedure over again at the beginning. The backup copy of the MS-DOS diskette must be identical to the original. After you have confirmed that the backup diskette is a good copy of the master MS-DOS diskette, you may put your master diskette away in a safe place. From now on, only use the master MS-DOS diskette to make copies. For all other purposes, use the backup copy of the MS-DOS diskette. By using the backup copy, you ensure that any accidental erasures can be replaced.

Copying on Dual Drive Systems

To make backup copies of your MS-DOS diskettes on a dualdrive system, follow the instructions below:

First, turn your computer on and boot up MS-DOS. Choose the Command Prompt option from the DOS shell menu. The system prompt will appear. Enter the following command:

```
A>DISKCOPY A: B:
```

This command indicates to MS-DOS that you want to copy the contents of a diskette in the A drive to a new diskette located in the B drive.

The following message will be displayed:

```
Insert SOURCE diskette in drive A:

Insert TARGET diskette in drive B:

Press any key to continue...
```

The "SOURCE" diskette is the disk that you will be copying from. The "TARGET" diskette is the one you will be copying to. Put your master MS-DOS diskette in the A drive, and a new, blank diskette in the B drive.

Warning!
If you have any doubts about which diskette goes in which drive, check them carefully. Make sure that the write protect notch on the master MS-DOS diskette is covered with a **write protect** tab.

Close bath drive doors. Press any key, such as the SPACEBAR. The A drive will be activated, and your computer will display:

```
Copying xx tracks
x Sectors/Track, x Side(s)
```

The contents of the disk are being read into your computer's memory. After a few moments, the following message will appear:

```
Formatting while copying
Copy another diskette (Y/N)?
```

For now, type N. The system prompt will reappear. To compare the backup diskette with the original, you will use the DISKCOMP command. Enter the command at the system prompt:

```
A>DISKCOMP A: B:
```

The computer will respond:

```
Insert FIRST diskette in drive A:

Insert SECOND diskette in drive B:

Press any key when ready...
```

Since both diskettes are already in their correct locations, press the SPACEBAR key. While the comparisons are being made, the computer will display:

```
Comparing xx tracks
x Sectors per Track, x Side(s)
```

When the computer is finished comparing the diskettes, the drives will turn off, and the following message will appear:

```
Compare OK

Compare another diskette (Y/N)?
```

Type N to return to the system prompt.

If there is a problem with the backup diskette or if you put the wrong diskette into the drive by mistake, the computer will respond:

```
Compare error on
side x, track x
```

After you have confirmed that the backup diskette is a good copy of the master MS-DOS diskette, you may put your master diskette away in a safe place and put the label on the backup diskette. From now on, only use the master MS-DOS diskette to make copies. For all other purposes, use the backup copy of the MS-DOS diskette. By using the backup copy for everyday computing, and saving the master diskette, you ensure that any accidental erasures can be replaced.

From now on, when this manual refers to the "main system diskette," use the backup MS-DOS diskette.

FILES

In the same way that you can keep information grouped together in manila folders, MS-DOS organizes data into files. While you may store these folders in a cabinet, your computer stores these files on disks. Separating information into files allows you to work with that information more efficiently.

File Types

There are two basic file types:

- Program files
- Data files

Program files are files that perform a task. They manipulate the computer and data files in order to achieve a result. MS-DOS is a collection of program files, as are the control programs found in application software.

Data files are files that contain the information (data) used by program files. A file containing a list of names and addresses would be a data file.

The two types of files are closely related. Program files usually create data files. These may be the documents created by a word processor, the numerical array created by a spreadsheet, or some other collection of information.

A data file containing a written report can't do anything by itself. On the other hand, a word processor is useless without documents to work on.

Filenames and Extensions

Needless to say, each file on a disk must be uniquely identifiable. To achieve this, MS-DOS requires that you name every file you create, as you create it.

In order to be able to manipulate files easily, MS-DOS has certain rules that you must follow when naming files. As you will see, these rules leave you a great deal of freedom in your selection of filenames.

Each filename can be up to eight characters long. To this eight character name can be added an "extension '.' Extensions always begin with a period (.) which is followed by up to three characters.

The format for a valid MS-DOS filename is:

ABCDEFGH.JKL

Most of the characters and symbols on your keyboard are available for use in filenames. These are:

- The letters A through Z
- The numbers 0 through 9
- The following symbols:

!	(exclamation point)
@	("at" sign)
#	(number sign)
$	(dollar sign)
0/0	(percent sign)
&	(ampersand)

(and) (parenthesis)

— (minus sign or hyphen)

{ and } (brackets)

_ (underline character)

The following are examples of allowable filenames:

JANUARY

CHAPTER.001

MEMO.APR

MAYSALES.$

$$,SALES.OCT

These filenames are valid because none of them are too long, and only legal characters have been used. The following are examples of illegal filenames, along with an explanation:

3RDQUARTER.SALES

This is too long. MS-DOS will accept this filename, but it will be shortened to fit the size limits. The altered filename would read 3RDQUART.SAL. As you can see, both the filename and its extension have been shortened to the legal length.

CHAPTER/4

The slash (I) is an illegal filename character. MS-DOS will reject the filename and ask for another.

NEW EMPL.LTR

This would be rejected by MS-DOS because of the space in the filename.

Certain filename extensions have been set aside so that MS-DOS can recognize program files. These are:

- COM (for COMMAND file)
- EXE (for EXECUTABLE file)
- BAT (for BATCH file)

Program files should always have one of these three filename extensions. Data files should never use these reserved extensions. They can, however, use any other extension.

Filename extensions are optional with data files, so you can leave them off entirely, if you want. Using filename extensions with data files allows you to have many different variations for a set of filenames. For instance, different chapters of a book might be named:

CHAPTER.001

CHAPTER.002

CHAPTER.003

and so on.

Like MS-DOS commands, filenames and extensions can be entered in either upper or lower case, but are always displayed on the screen in upper case. However, since MS-DOS converts lower case filenames into upper case, it is possible to inadvertently erase an existing file by saving a new file with a lower case name. To be safe, always make sure that you have given a unique name to each file on a disk.

Disk Directories

MS-DOS keeps track of the files stored on your disks by maintaining a "directory" on each disk. These directories are listings of the filenames and extensions, along with certain information about the files themselves, such as when the file was created or updated last.

The DIR Command

MS-DOS provides a simple command that allows you to look at the directory of any particular disk. This is the DIR command. Enter the command as follows:

```
A>DIR
```

The computer will display a listing similar to the following:

```
COMMAND  COM   XXXXX   X-XX-XX   XX:XXX
  :       :      :        :         :
  :       :      :        :         :
  :       :      :        :         :
  :       :      :        :         :
  :       :      :        :         :
  :       :      :        :         :
        XX File(s)      XXXXXX bytes free

A>
```

Some of the names and symbols may be different, but the screen should show these five columns, and a similar last line.

The information presented by the DIR command is as follows:

- The filename & extension
- The file size (in bytes)
- The date the file was created or last updated
- The time the file was created or last updated
- The number of files listed in the directory
- The number of unused bytes of space remaining on the disk

File Searches

You can also use the DIR command to search for specific files on a disk. To do this, enter the DIR command in the following format:

```
A>DIR (filename)
```

For instance, if you want to find the directory entry for a file named "MAYSALES.RFT" on the diskette in drive A, enter the command:

```
A>DIR MAYSALES.RPT
```

The computer will search the entire directory of the diskette for a file named MAYSALESRPT. If a file is found, it will appear as the only entry in the diskette's directory. If there is no MAYSALES.RPT file on the diskette, the computer will display:

```
Volume in drive A has no label
Directory of A:\
File not found

A>
```

Multiple Disk Drive Systems

The DIR command can be used to read the directories of other drives in your system, if any are installed. For instance, to read the directory of the B drive, when you are logged onto drive A, enter the command:

```
A>DIR B:
```

The computer will display the directory of the diskette inserted in the B drive. A similar command:

```
A>DIR C:
```

will cause the computer to display the directory of your hard disk.

Note that in both examples, the A drive remains the default drive. To change the default drive from A to B, and then display a directory listing, enter the command series:

```
A>B:
B>DIR
```

The computer will display the B drive diskette's directory, then remain logged to the B drive.

Wildcards

Quite often, when dealing with disk files, you may find yourself looking through directories for a particular file or group of files. MS-DOS has a way to help you sort out those files you want without having to read through the entire directory listing. This is through the use of "wildcard" characters. Wildcard characters are used to make a single command cover a number of similarly named files.

While MS-DOS provides several wildcard characters, the most one you will be using most often is the asterisk (*). The asterisk matches any number of sequential characters in a filename or extension.

For instance, to look at a listing of all the .EXE program files on your main system diskette, enter the command:

```
A>DIR *.EXE
```

This will produce a directory that looks like this:

```
APPEND   EXE   XXXX   X-XX-XX   XX:XXX
  :      EXE    :       :         :
  :      EXE    :       :         :
  :      EXE    :       :         :
  :      EXE    :       :         :

        XX File(s)       XXXXX bytes free
```

Application Software

Now that you know how to make backup copies of your diskettes and how to work with MS-DOS, you can proceed to use application software. Most software packages come with detailed instructions for their set-up and use. These instructions will often ask you to use the information in this chapter to find specific files in the disk directories, or back up the master diskettes provided with each package. Most software packages can be backed up simply by using the MS-DOS DISKCOPY command, as described above.

Chapter 5

Using Floppy Disks

Description

Your computer works with a large electronic memory array called RAM. This stands for Random Access Memory. Your system's RAM is actually an array of electronic circuits. As long as the computer is powered up, this circuit array will "remember" whatever is placed in it. When you turn the power off, however, these circuits will "forget." Therefore, you need some way of retaining your programs and data after you turn the system off. The most usual way of storing data, at least on DOS-based computer systems, is on floppy disks.

Virtually all commercially available programs are distributed on floppy diskettes. Before you buy an application software package for your computer, you should make sure that it will run under MS-DOS. Products labeled "for IBM PC," "for IBM PC/AT," "PC-compatible," or "MS-DOS-compatible" should run properly. Products intended for other types of computer operating systems, such as CP/M or Apple, will not run on your system.

> Note
> If you should accidentally try to run CP/M or Apple software, your computer will inform you that you are using non-DOS diskettes. This will not damage your computer.

The most frequent use that you will have for diskettes is to save the data, text, files, etc. that you create. You will use diskettes to store your data between sessions on the computer, as well as to back up your valuable software.

How Floppy Disks Work

Floppy disks, or diskettes, are made from a flexible plastic that is coated with a magnetic oxide. The floppy disk drive encodes this oxide with the data generated by the computer. After you turn your system off, unlike electronic RAM, the encoded oxide retains this data. Your data can then be read by the floppy disk drive at a later time.

The magnetic oxide coating on the floppy disk will hold its encoded data almost indefinitely unless you deliberately erase it. This is done intentionally when you want to update the information stored on the diskette.

The plastic disk is safely protected by a thin cardboard jacket. The diskette spins inside this jacket, allowing the entire surface of the diskette to be scanned by the drive's circuitry. Data is read from or written onto the diskette through the oval-shaped slots in the jacket.

Normally, the computer will write new information onto the unused space on the diskette. If there is no unused space, your computer will inform you that the disk is full. You can instruct the computer to write over the information that is already on the diskette. You might do this to update an inventory file, or change an address and phone number in a database.

Caution!
Updating, or overwriting, data stored on a diskette will erase the old information. Under most circumstances you cannot get it back.

Formatting Diskettes

When you get a new carton of diskettes, they are not yet ready to be used. First, they must be prepared to accept data. This is called "formatting" the diskette.

MS-DOS uses the same formatting method regardless of the computer used. This is one of the keys to intermachine compatibility. Since all PC-compatible computers use MS-DOS, they can read all disks created by any other PC-compatible machine.

> **Note**
> MS-DOS formats disks with a different "pattern" than Apple-DOS or CP/M. This is why your computer system cannot read these "foreign" disks.

To see what happens when you attempt to use an unformatted disk, insert a new blank diskette into the A drive and close the drive door. Then enter the following command:

```
C>DIR A:
```

Since the new disk hasn't been formatted yet, your computer cannot read it. After failing three times, your computer will respond:

```
General Failure error reading drive A
Abort, Retry, Failure?
```

If you type R (for Retry), or A (for Abort), the computer will attempt to read the diskette again, and will finally display the same message.

When you type F (for Failure), the computer will automatically cancel the attempt and will display the following message.

```
<Current drive is no longer valid>
```

Remove the unformatted disk from the drive.

The FORMAT Command

MS-DOS provides an external command program called FORMAT.COM, that will format your blank diskettes. When running this program, there are options available that allow you to format several different types of diskette.

The following routines will show you how to use the FORMAT command. These procedures assume that you are formatting double-sided, high-density, 1.2M-byte diskettes (AT-compatible). Information on formatting 180K-byte and 360K-byte diskette will be discussed under the /1 and /4 switch options below.

First, if you have a hard disk installed MS-DOS on your system, then enter:

```
C> FORMAT A:
```

The computer will load the FORMAT command file into system memory, then will respond:

```
Insert new diskette for drive A:
and press ENTER when ready
```

Insert the new diskette to be formatted and press the ENTER key.

The computer will display:

```
XX Percent of disk formatted
```

The formatting process takes a minute or two. The computer will wait until the formatting process is complete, then display:

```
Format complete

Volume label (11 characters, ENTER for none)?
```

Press ENTER if you don't want to have a label of your disk. Then the screen will display the following message.

```
XXXXXXX bytes total disk space
XXXXXXX bytes available on disk

      XXX bytes in each allocation unit
    XXXXX allocation units available on disk

Volume Serial Number is XXXX-XXXX

Format another (Y/N)?
```

Don't be concerned if the message displayed is slightly different from the example. Enter N to return to the system prompt.

The new disk is now formatted and is ready for use. Remove it from the disk drive and replace it in its protective envelope.

Option Switches

To format 180K-byte sigle-sided, sigle-density diskettes in the computer's high capacity disk drive, enter the FORMAT command using the 11 option switch:

```
C> FORMAT A: /1
```

The computer will proceed to format the diskette. Upon completion, you will see this message:

```
Format complete

Volume label (11 characters, ENTER for none)?
```

And the following screen will appear if you press ENTER. (If you want to have a volume label, type the characters and enter.)

```
XXXXXXX bytes total disk space
XXXXXXX bytes available on disk

      XXX bytes in each allocation unit
    XXXXX allocation units available on disk

Volume Serial Number is XXXX-XXXX

Format another (Y/N)?
```

The /4 option switch is used to format 360K-byte double-sided, double-density diskettes in the computer's high capacity disk **drive. To do this enter the command:**

```
C>FORMAT A:/4
```

The computer will proceed to format the diskette. Upon completion, you will see this message:

```
Format complete

Volume label (11 characters, ENTER for none)?
```

Press ENTER not to have a label of your disk. Then the screen will display;

```
XXXXXXX bytes total disk space
XXXXXXX bytes available on disk

      XXX bytes In each allocation unit
    XXXXX allocation unite available on disk

Volume Serial Number is XXXX-XXXX

Format another (Y/N)?
```

Enter N to return to the system prompt. Remove the diskette from the drive and place it in its protective envelope.

Caution!
360K-byte diskettes formatted on 1.2M-byte high density, AT-style drives may not be reliable when used on some 360K-byte, XT-style drives. The 14 option switch is primarily intended to permit the use of less expensive diskettes with AT-compatible systems like this one. If you need to have diskettes that can be safely read from and written to by both styles of computer, you should format the lower capacity diskettes on the XT-compatible system where they will be used.

Formatting a diskette allows you to use it by providing predetermined locations for certain files used by MS-DOS. Once formatted, the disk directory space is created, as well as additional areas reserved for use by MS-DOS. One of these areas is the File Allocation Table, or FAT. This part of the diskette contains a list of all of the files on the disk, and where they are physically stored on the diskette.

The other area is the system area. On your MS-DOS main system diskette, this area is occupied by the parts of MS-DOS that are copied into your computer's memory during the start-up routine. During the start-up procedure, the BIOS program, stored on the system motherboard, looks at this part of the diskette to retrieve the active parts of the disk operating system.

If these MS-DOS routines are not present in the system area of a diskette, the BIOS cannot startup the computer. This is what causes the error message:

```
    DRIVE NOT READY ERROR
Insert BOOT diskette in A:
Press any key when ready
```

You normally boot the system up from the MS-DOS main system diskette. The DISKCOPY command copied these files when you created the backup copy of the master diskette. Sometimes, though, you may want to create a "boot disk" that doesn't have all of the external DOS commands on it. For instance, you may want to make an "autoboot" copy of an application software diskette.

To format a new diskette while placing the active MS-DOS routines in the system area, enter the following command at the system prompt:

```
C>FORMAT A:/S
```

The computer will load the FORMAT command file into system memory, then respond:

```
Insert new diskette for drive A:
and press ENTER when ready
```

Insert a new, blank diskette and press the enter key to start the formatting process. After the new diskette is formatted the active MS-DOS routines will be copied into its system area. When the copying is finished the computer will display:

```
Format complete

Volume label (11 characters, ENTER for none)?
```

And the following screen will be appeared if you press ENTER. (If you want to have a volume label, type the characters and enter.)

```
XXXXXXX bytes total disk space
XXXXXXX bytes available on disk

      XXX bytes in each allocation unit
    XXXXX allocation units available on disk

Volume Serial Number is XXXX-XXXX

Format another (Y/N)?
```

Enter N to return to the system prompt. Then enter:

```
C>dir a:
```

The directory listing should appear similar to the following:

```
COMMAND COM XXXXX  X-XX-XX  X:XXX
      1 File(s)   XXXXXXX bytes free
```

Copying Files

If you have a dual drive system, it is easy to copy program and data files from one diskette to another. This involves the internal MS-DOS command, COPY.

Put the "source" diskette in drive A, and the "target" diskette in drive B. At this time, you may want to check the directories of both diskettes in order to make sure you will not overwrite a file on the target diskette with the same name at the one you want to copy.

Once you're sure it's safe to copy, enter the COPY command with the following format:

For example, to copy the file "MAYSALES.RPT" from drive A to drive B, enter the command:

```
A>COPY A:MAYSALES.RPT B:
```

When the copying process is done, the computer will display:

```
        1 File(s) copied

A>
```

You can also enter this command without the default drive letter, as:

```
A>COPY MAYSALES.RPT B:
```

When no drive letter is specified for the source drive, MS-DOS assumes that you want to copy a file from the default drive.

To perform the operation in reverse, that is, to copy from the B drive to the default drive, enter the command:

```
A>COPY B:MAYSALES.RPT
```

Note that this time, you were required to enter the source drive letter before the filename. This is because, in this example, drive B is not the default drive. However, since no drive letter was specified for the target drive, MS-DOS copied the file onto the default, or in this case, A drive.

It is also possible to copy a file between two disks when neither one is the default drive. For instance:

```
A>COPY C:MAYSALES.RPT B:
```

will copy the MAYSALES.RPT file from the hard disk onto a diskette in the B drive. This time, note that both source and target drive letters were used. This is because neither drive was the system default drive.

Wildcards

Copying files using wildcards in the filenames can be efficient, but it can also be dangerous. When using wildcards, always make sure you won't overwrite or erase another file. For example:

```
A>COPY *SALES.RPT B:
```

will copy all of the files ending in SALES.RPT to the B drive. The command:

```
A>COPY MAYSALES.* B:
```

will copy all files about MAYSALES to the B drive.

A final example:

```
A>COPY *.* C:
```

will copy all of the files on a diskette in the A drive to the hard disk drive. This command is useful when backing up diskettes containing data files.

Chapter 6

Using your Hard Disk

Depending on the model, your computer system can be expanded to included an optional hard disk drive. This chapter will give you a basic understanding of its operation and show you how to configure it. Information is also provided on how MS-DOS works with your hard disk drive.

What is a Hard Disk Drive?

As mentioned in Chapter 5, "Using Floppy Disks," your computer uses an electronic memory array called RAM. This memory is temporary and will only "remember" data as long as the system power is on. When you turn off your computer, any information stored in RAM is lost.

You have learned how to use floppy disks, or diskettes, to store data and program files between computing sessions. It is more convenient, however, to store your files on a hard disk drive. The main reason for this is the speed of the hard disk drive. Files are read off from the hard disk faster than from floppy diskettes. Also, using a hard disk reduces the amount of time spent inserting and removing diskettes from floppy disk drives.

A hard disk is very similar to a floppy disk. It is a plastic disk that has been coated with a magnetic oxide. A hard disk will store data indefinitely, until it is erased. Data is read from or written onto a hard disk in the exactly same way as with a floppy diskette.

There are differences between hard and floppy disks, though. First of all, a hard disk "non-removable." Unlike a floppy diskette, which can be taken out of its drive, the hard disk is

permanently mounted inside the drive housing. Several hard disk platters are stacked vertically in the drive housing and sealed in a dustproof casing.

Second, a hard disk holds much more information than a diskette. The "high-capacity" diskettes used in your computer can only hold a little over one million bytes. The hard disk can hold up much more data than floppy disk.

Finally, as mentioned above, a hard disk is much faster than a floppy disk drive. The main reason for this is that the hard disk platters are rigid, allowing them to be rotated at a much higher rate than floppy diskettes, which have to move relatively slowly so as to avoid damage.

Care of Hard Disk Drives

As you can see, hard disk drives are very precise devices. This precision makes for a delicate mechanism. Even though your hard disk drive is built to withstand the rigors of shipping, it should be moved as little, and as gently, as possible. If you need to move your computer system a short distance, be careful not to drop or bump it. For greater protection, if you need to transport the computer in a car, or ship it by truck or plane, pack your system in its original shipping boxes.

The TGSHIP command should be run whenever you are going to move the main system unit. This command moves the read/write heads inside the hard disk drive to a "safety zone," where they won't accidentally scratch the surface of the drive platters. TGSHIP.COM is a special DOS command file included with your system. You should copy this file into the root directory of your hard disk drive. For information on hard disk directory structures, see the "Organizing Your Hard Disk" section of this chapter.

Preparing Your Hard Disk

This section assumes that you have a hard disk drive system physically installed in your main system unit. If you haven't installed your hard disk drive yet, see Chapter 7, "Expanding Your System," for information how to do this.

To begin, boot up your system using your MS-DOS as explained in Chapter 4, "Using MS-DOS.' Then enter this command:

```
A>C:
```

If the computer responds with:

```
C>
```

enter:

```
C>DIR
```

If a directory listing is displayed, even if there are no files shown, it means that your hard disk system has already been partitioned and formatted. You will see the COMMAND.COM file at the top of the directory listing if the MS-DOS active routines have been loaded onto the hard disk. If your hard disk has been partitioned and formatted, skip this section on installing your hard disk.

If the computer responded to the A > C: command with:

```
Invalid drive specification
```

it means that MS-DOS can't "find" the hard disk drive. This is either because the drive controller board has been incorrectly set up, or more likely, the hard disk drive has not yet been partitioned.

If the computer correctly executed the C: command, but failed to display a directory, it probably means that the hard disk has been partitioned, but not yet formatted. The next sections describe how to partition and format your hard disk system.

Changing Your SETUP

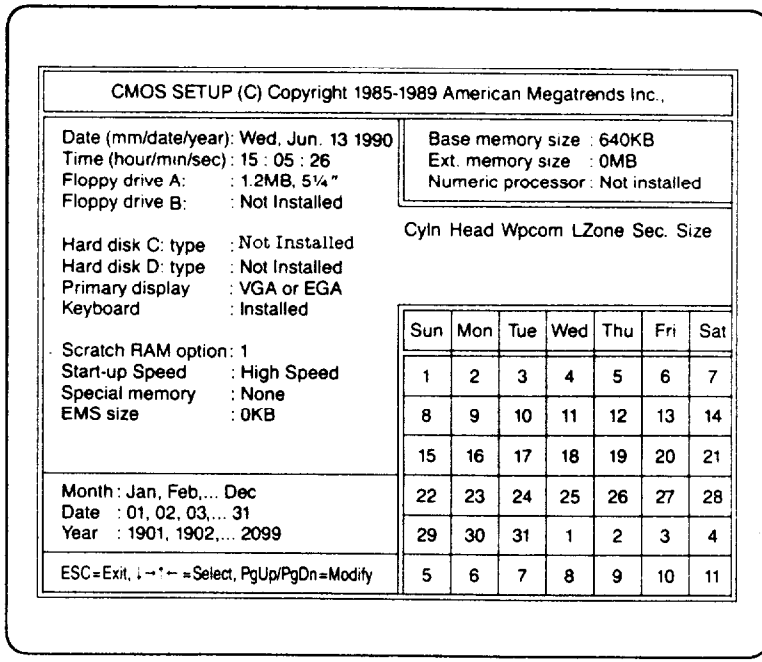
Before you can partition and format your hard disk, you have to let your computer know that you have one. This is done with the SETUP program. Once you have determined that your hard disk is "clean," that is to say neither partitioned nor formatted, you should enter the SETUP program.

> **Note**
> If you are not familiar with the SETUP program, take a moment to review the information in Chapter 2, "The CMOS Setup Program"

Turn your computer on. When you see the following mesage,

```
Press <DEL> if you want to run SETUP or DIAGS
```

press <DEL> key. Move the cursor to the RUN SETUP option and press Enter. The system displays the Setup Menu. For now, look at the information on the left side of the screen.


CMOS SETUP (C) Copyright 1985-1989 American Megatrends Inc.,
Date (mm/date/year): Wed, Jun. 13 1990
Time (hour/min/sec) : 15 : 05 : 26
Floppy drive A: : 1.2MB, 5¼"
Floppy drive B: : Not Installed
Hard disk C: type : Not Installed
Hard disk D: type : Not Installed
Primary display : VGA or EGA
Keyboard : Installed
Scratch RAM option: 1
Start-up Speed : High Speed
Special memory : None
EMS size : 0KB
Base memory size : 640KB
Ext. memory size : 0MB
Numeric processor : Not installed
Cyln Head Wpcom LZone Sec. Size
Sun Mon Tue Wed Thu Fri Sat
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31 1 2 3 4
5 6 7 8 9 10 11
Month : Jan, Feb,... Dec
Date : 01, 02, 03,... 31
Year : 1901, 1902,... 2099
ESC=Exit, ↓→↑←=Select, PgUp/PgDn=Modify

Move the screen cursor bar down to the Hard Disk C parameter. Using the PgUp and PgDn keys, scroll through the options to disk type number matched with the hard disk you have. If you select the type number 17 for 41MB hard disk, it provides the following information under the right hand headings:

```
Cyl   Hd   Pre   LZ    Sec   Size
977   5    300   977   17    41
```

This should match the information provided with your hard disk drive. Other hard disk drives may require a different disk type number. See the instructions provided with your hard disk drive or call your dealer for assistance. After verifying the hard disk drive type number, press the ESC key. The computer responds with:

```
Write data into CMOS and exit (Y/N)?
```

Press Y. The computer will update the information in its configuration RAM, and will go through the start-up routine again. Make sure MS-DOS is installed on floppy disk or hard disk of your system, so the system will boot up in MS-DOS.

Note
Your system has an on board IDE type HDC and if you want to install the another type of HDD except IDE, you must disable the on board IDE HDC using the BIOS setup program. See Chapter 2 for the detailed information of it.

Partitioning Your Hard Disk

After the DOS Shell screen appears, select the Command Prompt option. At this point your are ready to initialize your hard disk drive. To do this, enter the command:

```
A>FDISK
```

After loading the FDISK program, the computer will display information on the hard disk drive installed in the system, as follows:

```
     MS-DOS Version x.xx
   Fixed Disk Setup Program
(C) Copyright Microsoft Corp. 19xx, 19xx

   FDISK Options

Current fixed disk drive: 1

Choose one of the following:

   1. Create DOS Partition or Logical DOS Drive
   2. Set active partition
   3. Delete DOS Partition or Logical DOS Drive
   4. Display Partition information
   5. Select Next fixed disk drive

Enter choice: [I]

Press ESC to exit FDISK
```

Note
If you only have one hard disk drive, option 5 will not be displayed.

Press ENTER to choose the default selection, "Create a DOS Partition." The FDISK menu will disappear, and be replaced by:

```
      Create DOS Partition or Logical DOS Drive

Current fIxed disk drive 1

Choose one of the following

   1 Create Primary DOS Partition
   2 Create Extended DOS Partition
   3. Create Logical DOS Drive(s) in the Extended DOS partition


Enter choice [1]

Press ESC to return to FDISK options
```

To create a single MS-DOS partition for your entire hard disk drive, select the default option (#l) by pressing ENTER. The Create Primary DOS partition menu appears next:

```
Create Primary DOS partition

Current, Fixed Disk Drive: 1

Do you wish to use the maximum size
for a DOS partition and make the DOS
partition active (Y/N) ..... ? [Y]

Press ESC to return to Fdisk Options
```

To reserve the entire hard disk for MS-DOS, press the ENTER. FDISK now displays the following message:

```
System will now restart

Insert DOS diskette in drive A:
Press any key when ready ...
```

It is common to use FDISK to create an MS-DOS partition that takes up the entire hard disk drive and then make that partition bootable. Now that you have completed these tasks, you can restart your system using your MS-DOS Install diskette.

> Note
> For information on the remaining FDISK menu selections, see your MS-DOS User's Guide.

Make sure the MS-DOS install is in the A drive, then press the ENTER key. Your system will now reboot. It does this to update the new partition information in its configuration RAM. You may now format yor hard disk, and load the MS-DOS system files onto it.

Formatting Your Hard Disk

Now that your hard disk is partitioned, you need format it.

> Note
> If your hard disk drive has already been partitioned for MS-DOS, it may have been formatted at the same time. Use the DIR command to check the contents of the drive. If your hard disk is formatted, there may be files stored on it that you will need. Skip this section on formatting and proceed to the next section, "Organizing Your Hard Disk."

If your hard disk needs to be formatted, begin by selecting the Command Prompt option from the DOS shell. Enter the following command:

```
A > FORMAT C: /S/V
```

The floppy disk drive indicator will come on for a few seconds, while the FORMAT command is into memory. When the light goes out, the computer will display:

```
WARNING, ALL DATA ON NON-REMOVABLE DISK
DRIVE C: WILL BE LOST!
Proceed with Format (Y/N)?
```

You should already have made sure that there is no information stored on the hard disk that you want to save. Press Y to begin formatting. The formatting process takes several minutes. When it is completed, the system will display:

```
Formatting
System transferred

Volume label (11 characters, ENTER for none)?
```

Here, your computer is asking you to name your hard disk drive. This is a result of the N switch used with the FORMAT command. A disk label can be useful when sorting directories, so you may want to enter one now.
A volume label can use up to eleven characters. See Chapter 4, "Using MS-DOS," for a list of valid label characters. When you have entered the drive label, your computer will respond:

```
XXXXXXXX bytes total disk space
    XXXXX bytes used by system
XXXXXXXX bytes available on disk
```

The IS switch in the FORMAT command caused the active portions of MS-DOS to be loaded onto the system area of the hard disk. At this point you can boot the system from the hard disk.

Organizing Your Hard Disk

This section provides you with a sample directory structure for use with your hard disk. It will provide step-by-step instructions that will create several files and subdirectories.

First, make sure your hard disk is formatted, and that the active MS-DOS routines have been loaded into the system area of your hard disk. The easiest way to check this is to boot the system from the hard disk. Make sure that floppy drive A is empty and turn your computer on. After going through the start-up diagnostic routines, the computer will look at the A drive to find the MS-DOS install diskette. Since the drive is empty, it will then look at the hard disk drive. If the hard disk drive is installed and formatted correctly, the system will boot up and display the DOS shell screen.

If your system does not boot up from the hard disk, refer to the previous section, "Formatting Your Hard Disk" for instructions.

Assuming MS-DOS has booted correctly from the hard disk, select the Command Prompt option from the DOS shell menu. When you see the system prompt:

```
C>
```

you are ready to begin.

First, you will create several subdirectories. These will be used shortly to contain useful files. Begin by entering the command:

```
C>MD DOS4
```

The MD command is a short form of MKDIR. This internal DOS command creates a subdirectory under the directory you are currently in. Since your computer boots up in the hard disk root directory, the command you just entered created a subdirectory named DOS4 under the root directory.

> Note
> If you don't understand the term "root directory" refer to your MS-DOS User's Guide, "Files and Directories."

When the computer displays the C > prompt again, enter:

```
C>DIR
```

to see what you have done. You should see a directory listing similar to the following:

```
COMMAND  COM   XXXXX   X-XX-XX   X:XXX
FORMAT   EXE   XXXXX   X-XX-XX   X:XXX
  :       :      :         :         :
  :       :      :         :         :
  :       :      :         :         :

DOS4        <DIR>          X-XX-XX   X:XXX
       X File(s)       XXXXXXXX bytes free

C>
```

Just as MS-DOS commands usually look at the "current" disk drive, they also look at the current directory. Since you can change the current, "1ogged" disk drive, you would expect to be able to change the current, logged directory. You can, using the CD (CHDIR) command. Enter the command series:

```
C>CD DOS4

C>DIR
```

The directory listing displayed should look like this:

```
.          <DIR>        X-XX-XX   X:XXX
..           DIR>       X-XX-XX   X:XXX
       2 File(s)       XXXXXXXX bytes free

C>
```

You have just moved to the DOS4 subdirectory. The two <DIR > entries indicate that you are currently logged onto a disk subdirectory. The period (.) entry represents the current directory, while the double period (..) entry represents the parent directory for the current subdirectory. These shorthand entries allow you to move up and down through a directory tree rapidly. To see how these shortcuts work, enter the command series:

```
C>CD..

C>DIR
```

You will see that you are back in the hard disk root directory. Now return to the DOS subdirectory by entering the command:

```
C>CD DOS4
```

Another way of moving through the directory tree quickly involves the use of a similar command:

```
C>CD\
```

This command will take you directly to the root directory of the current disk drive. This can be useful if you get "lost" in a large directory tree.

The next step in organizing your hard disk involves copying the external command files from the MS-DOS main system diskette into the DOS4 subdirectory on the hard disk. First, make sure you are currently logged into the DOS4 subdirectory by entering the command sequence:

```
C>CD\

C>CD DOS4
```

Insert the MS-DOS install diskette into the A drive. Close the door, then enter:

```
C>COPY A:*.* C:
```

This command will copy the entire contents of the MS-DOS install diskette into the DOS4 subdirectory on the hard disk. When the copying process is complete, your computer will

display the following message:

```
        xx File(s) copied

C>
```

Using the DIR command, run a directory to verify that you have copied the MS-DOS diskette.

Remove the MS-DOS install diskette from drive A and replace it with the MS-DOS select diskette into the DOS4 subdirectory on the hard disk by entering the command.

```
C> COPY A:*.*. C:
```

. When the copying process is done, carefully enter the following series of commands:

```
C>DEL COMMAND.COM
```

These commands will remove the COMMAND.COM files from the DOS4 subdirectory. Since the files is available in your hard disk root directory, it is not necessary to include it in the DOS4 subdirectory. Later, as your hard disk gets filled up with application software program and data files, the disk space saved by deleting such duplicate files might become useful,

Repeat the copy procedure described above for the remaining disks in the MS-DOS package.

Return to the root directory by entering:

```
C>CD C:\
```

You have now completed organizing your hard disk and installing the MS-DOS files into subdirectories. As you can see, the files have been placed in subdirectories according to the type of activity you will doing when using them. As you add application programs to the hard disk, it is a good idea to create subdirectories to store them in, so as to keep different program groups separated.

For more information on directory and subdirectory organization with MS-DOS, see your MS-DOS User's Guide.

Backing Up Your Hard Disk

It is highly recommended that you make back up copies of your valuable hard disk files regularly. Because hard disk drives are fragile, they can sometimes be damaged. It is also possible to erase some or all hard disk files through the use of incorrect FORMAT and COPY commands. Backing up your files is the only way you can be sure that you don't lose information you may have spent months or even years gathering.

Two external command programs on your MS-DOS install diskette will help you back up your hard disk. The first, BACKUP, will copy files from the hard disk onto diskettes. The other, RESTORE, allows you to use the diskettes created by the BACKUP program to reload the files back onto the hard disk, if necessary. The following sections describe how to use these two command programs.

The BACKUP Command

This command backs up one or more files from your hard disk onto floppy diskettes. The diskettes must be formatted by the MS-DOS FORMAT command. Do not use the /S switch when formatting these diskettes. Disk space taken up by the inclusion

of the active MS-DOS routines would be wasted with the BACKUP command.

> **Note**
> For information on formatting diskettes, see Chapter 5, "Using Floppy Disks."

When you back up your hard disk using BACKUP, the first thing to do is to format enough blank disks to hold the backed up files. Once you start the BACKUP routine, you won't want to stop the program to format more diskettes. BACKUP takes time, even on a high speed computer. Stopping the BACKUP command before completion usually means that you would have to start the process over again. Therefore, make sure you have enough formatted diskettes before you start.

How Many Diskettes?

The number of diskettes you will need depends on two things. First, how much of the hard disk will you be backing up? Second, what is the capacity of the diskettes you will be using? The following table shows the approximate number of diskettes needed to backup an entire hard disk.

HARD DISK CAPACITY:	NUMBER OF DISKETTES: 180K -	360K	1.2M
10M-byte	63	32	10
20M-byte	125	63	20
30M-byte	185	95	30
40M-byte	250	125	40

A few extra diskettes have been included in these numbers to make sure there are enough. If your hard disk is not loaded to capacity, or if you are only backing up part of your hard disk, fewer diskettes will be needed.

As you format these disks, prepare labels for them that identifies these diskettes as a hard disk backup archive. Also put the date on each label and number each diskette. This is very important, since the RESTORE command requires that you use the diskettes in the same order that was used during the BACKUP procedure.

This file contains the BACKUP command program. As mentioned above, this file is provided on your MS-DOS install diskette. You can run the program from the floppy disk drive or from the hard disk, if you have copied the file into a subdirectory on the hard disk.

To back up the entire hard disk, start by changing the system default drive to the hard disk. Enter:

```
A>C:
```

Next, make sure you are in the root directory of the hard disk. Enter:

```
C>CD C:\
```

Now, make sure your diskettes are formatted and ready. If you are running BACKUP from the MS-DOS install diskette, enter the command:

```
C>A: BACKUP C:\ A: /S
```

If you have set up your hard disk directories as described in the "Organizing Your Hard Disk" section above, enter the command:

```
C>BACKUP C:\DOS4 A: /S
```

In the first example, the A:BACKUP command tells MS-DOS to search the A drive for the BACKUP.COM file. In the second, the C:/DOS4 statement will automatically direct MS-DOS to look in the C:\DOS4 subdirectory for the file.

In both examples, the A: portion of the command tells MS-DOS that you want to start the backup routine with the root directory of the hard disk, and store the backup files on diskettes in drive A. The final /S switch tells MS-DOS to back up all of the subdirectories on the hard disk in addition to the root directory.

For a more detailed explanation of the MS-DOS BACKUP command, see your MS-DOS User's Guide.

The RESTORE Command

MS-DOS provides the RESTORE command program to allow you to copy files from the archive diskettes created by the BACKUP command back onto the hard disk. You should only have use the RESTORE command if:

- Your hard disk has been damaged, then repaired or replaced
- Files have been accidentally erased from the hard disk
- You have reformatted the hard disk

To use RESTORE, first make sure the hard disk is ready to receive files. Boot your system up with the MS-DOS installed diskette in drive A. When you get to the system prompt, enter:

```
A>C:
```

If the computer responds with:

```
C>
```

enter:

```
C>DIR
```

If a directory listing is displayed, even if there are no entries, it means that your hard disk system is ready to receive files. If the active routines of MS-DOS have been loaded on to the hard disk, you will see the COMMAND.COM file at the beginning of the directory listing.

If the computer responded to the A>C: command with:

```
Invalid drive specification
```

it means that MS-DOS can't "find" the hard disk drive. This is either because the hard disk controller board has been incorrectly set up, or more likely, the hard disk drive has not yet been partitioned.

If the computer correctly executed the C: command, but failed to run a directory, it probably means that the hard disk has been partitioned, but not yet formatted. Refer to the section above, "Installing Your Hard Disk," for more information.

Once you have made sure the hard disk is ready to receive files you may proceed with the RESTORE procedure. The routine described below should only be used to restore the entire contents of the backup archive diskettes to an empty hard disk. For information on partial backups to a hard disk drive containing files, see the entry for the RESTORE command, in your MS-DOS User's Guide, "MS-DOS Commands."

First, set the C drive directory to the root directory by entering the command:

```
C>CD C:\
```

Now set the system default drive letter back to drive A by entering:

```
C>A:
```

The computer will respond by displaying:

```
A>
```

Make sure your MS-DOS install diskette is inserted into the A drive. Enter the following command:

```
A>RESTORE A: C:\/S
```

The RESTORE command file will be read from the MS-DOS install diskette. The A: C:\ in the command tells MS-DOS that you will be restoring files from diskettes in the A drive to the hard disk root directory. The /S switch tells MS-DOS that you want to restore the subdirectories as well as the root directory files.

You will be prompted to insert the backup archive diskettes into the A drive, one at a time. It is very important that you insert these diskettes in order. The BACKUP command program codes each archive diskette with an identification number, which is read by the RESTORE program. The use of this i.d. number ensures that your files are reassembled properly, and loaded into the correct subdirectories.

Chapter 7

Expading Your System

As you get more familiar with your computer system, you will probably want to add hardware to it. This can include additional disk drives, printers, modems, etc. This chapter addresses the installation of some of the most common devices.

Note
Because a wide variety of expansion products are available for your system, and configuring them to communicate over general purpose interfaces can be a complex task, it is impossible for this manual to provide detailed instructions for connecting these devices. Please follow the instructions provided with your peripheral. If you should have problems with the installation of a peripheral device, contact your dealer for assistance.

Connecting Peripherals

Peripherals are devices that can be connected to your computer system to increase its ability to communicate and process information. The term "peripheral" is usually used to indicate an externally mounted unit that is connected to your computer with a cable. Peripherals available for your computer system are:

- ❑ Keyboards
- ❑ Video monitor systems
- ❑ Printers

- ❑ Modems
- ❑ External disk drives

Your computer is designed to communicate with peripherals by way of the connectors on the rear panel of the main system unit. The connectors are called "ports," and allow information to be sent back and forth between the system CPU and a peripheral device.

Your keyboard and your video monitor connect to the main system unit by way of two specialized ports. The keyboard is connected to the "Keyboard port" on the rear panel of the main system unit. If you have purchased a video monitor system for your computer, the display monitor is connected to the "video port" on the rear panel of the video controller card, which is mounted inside your main system unit.

Since your system CPU must be in constant communication with both the keyboard and the display monitor, specific circuits connect them together. Since other peripheral devices only communicate with the system CPU occasionally, they can use general purpose ports.

Computerized data is composed of electronic words called "bytes." As an example, each letter or number that appears on your display monitor has been sent from the main system unit to the monitor itself in the form of a single byte. This byte is made up of individual "bits." in the same way that a word is made up of letters. In order to keep things consistent for the system CPU, bytes are made up of groups of eight bits. Using eight-bit bytes results in 256 basic combinations, each of which corresponds with a specific letter or number.

Note
Your computer is referred to as a "16-bit" computer. This system can address over 16M-bytes of memory. In order to address this much RAM, the internal data communications in this computer use 16 parallel data lines.

Serial Ports

There are two basic kinds of general purpose I/O (Input/Output) port. One kind is a "serial" port, where data bits are sent one at a time along a single wire, in series. Additional wires are used to send control signals between the transmitting and receiving devices. These control signals allow the two communicating devices to determine which of them will send or receive the data, and when the first bit of a particular byte is being sent, among other things.

Standardized "protocols" for these signals have been agreed upon by the microcomputer industry so that the different manufacturer's machines can communicate with each other.

Your computer system uses the "RS232C" asynchronous serial communications interface. The first serial port connector is the left-hand 9-pin "D-type" connector mounted on the rear panel of the system motherboard. The second is on the center of the system rear panel.

Electrical information for the serial port is in Appendix A, "Specifications." For details on the serial port pin connections, see Appendix D, "Connector Pinouts."

MS-DOS uses labels to refer to the various I/O ports on your computer. The RS-232C serial ports are assigned the "COMl" (Communications port #l) and "COM2" (Communications port #2) label.

Parallel Ports

Unlike serial ports, parallel ports allow your computer to communicate one entire byte at a time. Eight wires are included in the cable to permit the transmission of each of the eight data bits simultaneously. Extra wires are included in the cable for control signals. Your Computer uses the industry standard "Centronics-compatible" parallel printer port interface.

Connecting Printers

To install this type of printer, connect an appropriate cable between the parallel port connector on the rear panel of the system motherboard in the main system unit and the input connector on the printer. Information on the correct cable will be found in your printer's manual.

> **Note**
> Some printers, like the HP LaserJet, can use the RS-232C serial interface port. See the printer's manual for complete installation instructions.

Connecting Modems

Modems are used to connect your computer to the telephone line. Since the electronic requirements for the transmission of your voice are different from those used by your computer, a modem is used to "translate" your digital information to a signal that can be sent over the telephone lines.

Internally mounted modems are attached to a circuit board that will be installed inside your main system unit. These modems can communicate directly with the system CPU through your computer's internal circuitry. The telephone line is plugged into a socket located on the rear panel of the modem.

External modems connect to your computer's RS-232C serial port. Connectors are provided on the modem itself for attachment to the phone system.

Connecting External Disk Drives

At some point, you may decide to add an external disk drive. This may become necessary if all of the internal drive compartments are in use, or if you want to place your main system unit away from your work area, while keeping a drive next to your keyboard.

The floppy disk drive control port is provided on your system motherboard. While the cabling for these ports has been designed to be used inside the main system unit cabinet, it is possible to route the connectors outside to an external drive by using a longer cable. This cable can be routed outside the main system unit by way of an unused expansion slot panel.

For installation instructions, refer to the manual provided with your external disk drive.

> **Note**
> For instructions on opening the main system unit cabinet, see the section "Opening and Closing the Case," later in this chapter.

System Expansion And Upgrades

This section deals with the addition of expansion boards and products to your computer's main system unit. Although most expansion products are provided with detailed instructions for their installation and use, it is recommended that you read through this section in order to familiarize yourself with some of the basic principles of expanding your computer.

Tools Required

To install most expansion products in your main system unit, you will usually need the following tools:

- ❑ a small/medium "Phillips-type" screwdriver
- ❑ a small flat-blade screwdriver

General Precautions

In the interests of personal safety and product reliability, you should review the following information:

- ❑ Follow all of the instructions and warnings marked on this product, or included in this manual.
- ❑ Make sure you have enough room to work on the unit. If necessary, disconnect any peripheral device cables connected to the unit's rear panel.
- Cl For additional information on safety and maintenance, refer to the appropriate sections of this manual's introductory chapter.

Stop!
When you remove the main system unit cover, observe the following precautions:

- The power supply cord must be unplugged before the main system unit cover is removed. (Separe le cordon d'alimentation et puis enleve le couvercle.)
- Once removed, the cover must be replaced and screwed in position before the power supply cord is plugged back in. (Apres le couvercle a enleve, visse le couvercle en place et remettre le cordon d'alimentation.)

Warning!
Installing or removing circuit boards or plugging cables in with the system AC power turned on can damage your system.

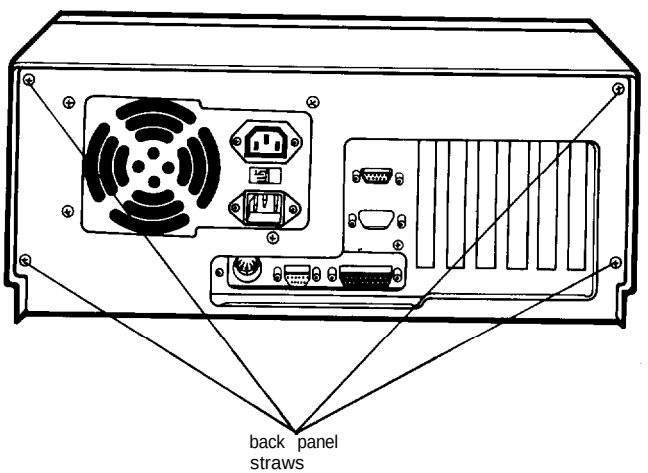


Figure 7-1. Cover Mounting Screws

Opening and Closing the Cabinet

The procedure for opening the main system unit cabient is as follows:

- ❑ Unplug the video monitor AC power and signal cables from their rear panel sockets. Set the monitor safely aside.
- ❑ Unplug the keyboard and set it aside.
- ❑ Unscrew the screws on the rear panel of the unit and set them aside.
- ❑ Carefully, slide the main system unit's cover towards the front of the unit. Continue sliding the cover forward until it can be removed completely. Set the cover aside.

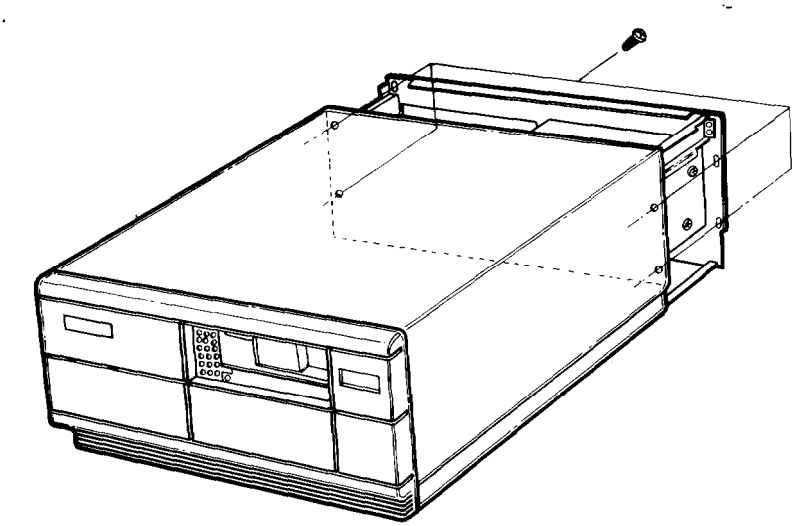


Figure 7-2. Removing the Cover

Later, to close the unit, follow these steps in order:

- ❑ Make sure all the system and expansion boards are properly seated in their connectors, and have had their mounting screws tightened down.
- ❑ Make sure all the internal cables have been properly connected and arranged neatly. Wires should not be pinched or caught between chassis parts or circuit boards.
- ❑ Carefully slide the cover back onto the main system unit, being careful not to damage the cables.
- ❑ As you slide the cover onto the unit, adjust the alignment to permit the cover to slide over the disk drive nosepieces.
- ❑ When the cover is properly seated on the main system unit chassis, replace and tighten down the screws on the rear panel.
- ❑ Reconnect the keyboard to its connector on the rear panel of the main system unit.
- ❑ Place the video monitor on top of the main system unit and connect the AC power and signal cables to their correct sockets on the rear panel.
- ❑ Reconnect any peripheral device to their rear panel 110 port connectors.
- ❑ Plug the AC power cable into the socket on the rear panel of the main system unit and the main AC power outlet.

Installing Circuit Boards

Most of the expansion products you will be installing into your computer are circuit boards. Like the system boards installed at the factory, expansion boards are plugged into the main system unit's mother board.

There are expansion boards available for a wide variety of functions. The most common expansion boards provide such functions as extra I/O ports, high resolution video graphics and system memory expansion.

The basic computer is shipped from the factory with only the system motherboard installed. This system has IDE-type HDC controller and the Floppy Disk controller on the system motherboard.

If you are adding other systems to a basic computer, or expanding your system by installing additional hardware, follow the procedure below to install the circuit boards.

First, read all of the instructions provided with the expansion product. Then, carefully unpack the circuit board(s) to be installed.

> Warning!
> Most computer circuit boards have "static sensitive" components on them. These parts can be damaged by static electricity, which can be generated by rubbing your hand across the exposed metal parts on the board. To avoid this damage, always handle circuit boards by their edges, being careful to avoid contact with the exposed edge connectors and parts.

Following the instructions provided with the expansion board, set any configuration switches and jumpers on the expansion board.

Open the main system unit cabinet and set the configuration jumpers on the system motherboard to match the new hardware arrangement. You will be able to do this without removing the system motherboard from the main system unit chassis, although you may need to unplug the disk drive ribbon cable from its connector to allow easy access to the jumpers.

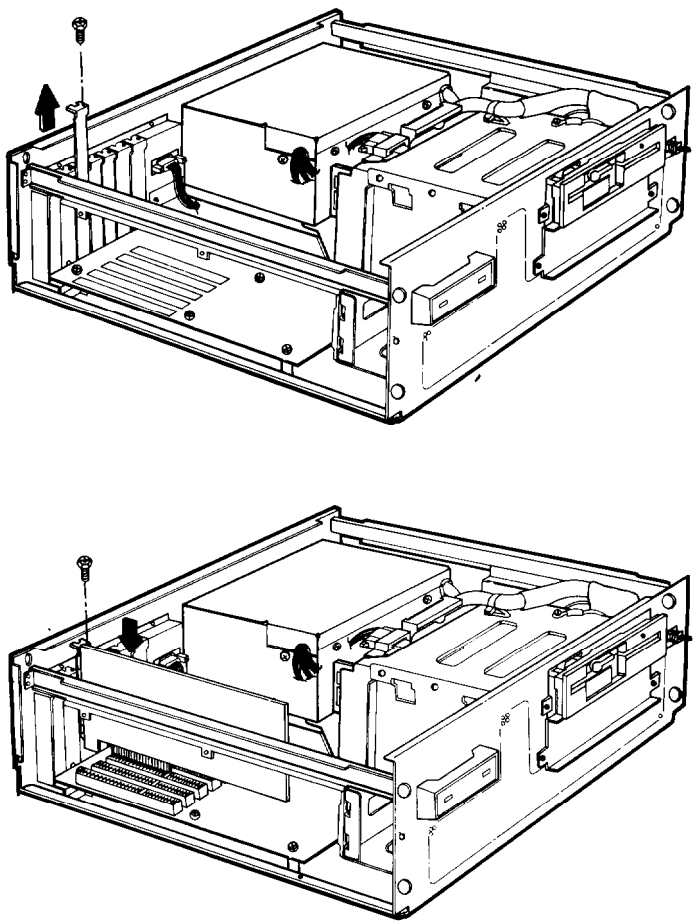


Figure 7-3. Installing the Circuit Boards

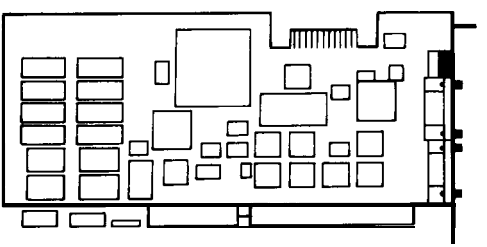
Disconnect any internal cables that may be in the way. As you do, make a note of their correct locations and orientations for later reattachment. Unscrew the retaining screw for the slot guard, and set it aside. Mount the expansion board into the slot by gently sliding the board into the slot. If the board is long enough to reach the card guide mounted on the front panel support flange, slide the board down the center groove of the guide.

Making sure the board is correctly aligned, carefully insert the board's edge contacts into the slot connector on the main system unit's motherboard. A gentle rocking motion is helpful in getting the board started in the edge connector.

Once started, press the board into the motherboard connector until it is seated completely. The tab at the bottom of the mounting bracket should fit into the slot at the bottom rear of the main system unit, and the bracket's top flange should rest directly on top of the rear panel support.

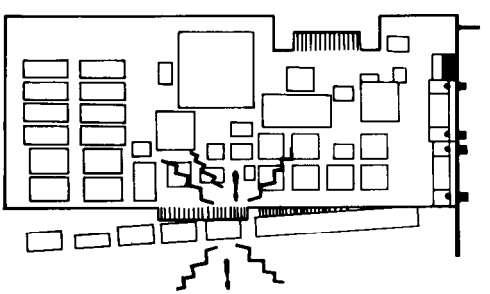
CORRECT

NO ELECTRICAL OR PHYSICAL RESTRICTIONS



INCORRECT

PHYSICAL RESTRICTIONS



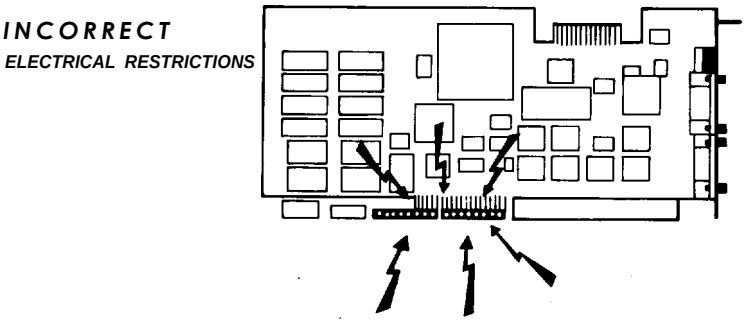


Figure 7-4. Installing the Option Card in an Expansion Slot

Check the board's alignment to make sure it is straight and level. If necessary, move the board slightly to align the hole in the top of the mounting bracket over the screw hole in the main system unit's rear panel flange. Install the hold down screw that you removed earlier.

Reconnect any internal cables that were disconnected earlier. If you have a problem making the cables reach their connectors, you may have to move the board you just installed to another slot. If any external equipment is used with the expansion board, connect it to the board's rear panel connector(s), following the instructions given with the product.

When the installation of the board is completed, close the main system unit cabinet as described above.

Disk Drive Compartments

To install expansion devices such as additional floppy disk drives into the main system unit's disk drive compartments, follow the procedure given below.

First, make yourself familiar with the specific installation procedure for the expansion device by reading all of the

documentation provided. Then, remove the main system unit cover as described above. Select the drive compartment where you will install the expansion device. Remove the blank front panel from the selected compartment by removing the mounting screws.

Slide the expansion device into the compartment along the side rails of the drive cage until it is all the way in. Replace the hold down clamps and their mounting screws.

Connect any internal power cables to the correct pins on the rear of the expansion unit. Connect any required control cables to the device. Close the main system unit cabinet as described above.

> Note
> Your main system unit is supplied with the cables necessary to connect two floppy disk drives to the system motherboard. Follow the instructions pro&d with the expansion floppy disk drive for proper installation.

Internal Hard Disk Drive

If you are to mount the internal hard disk drive inside the main system unit case, follow the steps below:

- ❑ Remove the cover from the main system unit, as described above.
- ❑ Remove mounting plate by unscrewing the hold down screws.
- ❑ Attach the hard disk drive to the mounting plate by installing the four mounting screws through the bottom of the plate into the bottom of the drive frame.
- ❑ Replace the mounting plate onto the mounting frame by sliding the plate into the two openings provided in the mounting frame.
- ❑ Replace the hold down screws.

Connect the hard disk drive controller cables to the drive.

◇

Replace the main system unit cover.

Note
Your system has an on board IDE type HDC and if you want to install the another type of HDD except IDE, you must disable the on board IDE HDC using the BIOS setup program. See Chapter 2 for the detailed information of it.

Appendix A
Specifications

Computer System

- Operating Temperature : 41" to 95°F (5" to 35°C)
- Storage Temperature : -5" to 140°F (-15" to 60°C)
- Operating Humidity : 20% to 80% (no condensation)
- Storage Humidity : 10% to 90% (no condensation)
- Compatibility : IBM PC/AT
- Power Supply : 145w
  110 Range: 100 - 125 VAC, 4A, 5016OHz
  220 Range: 220 - 240 VAC, 2A. 5016OHz
- Keyboard : 10 1 key keyboard

System MotherBoard

- PCB Fabrication : 4 Layer Glass Epoxy
- Firmware : AM1 Software BIOS
- Operating System Support: MS-DOS
- Bus Interface : IBM PC/XT, PC/AT-compatible
- Expansion Slots : 5ea 16-bit (98 pin connector)

- Dynamic RAM (with parity) : ZM-bytes, expandable 32M-bytes on Motherboard
  80ns, 0 wait state access
- Static RAM (CACHE Memory) : *32KB* (35ns, 0 wait state access)
- Floppy Disk Drive Support: 2ea - 360K, 720K, 1.2M or 1.44M-byte
- I/O Ports : 2ea 9-pin RS-232C asynchronous serial communication port
  lea 25-pin Centronics-compatible parallel printer port
  lea 5-pin Keyboard port
- Audio Support : 1 mini-speaker
- Real Time Clock

CPU Logic

- Main Central Processor IC : 386sx-20″ microprocessor
- Math Coprocessor IC (optional) : 387sx™ coprocessor

System Memory

- Memory Address Space : 24 Address lines (16MB)
- Data Interface : 16-bit memory access
- Cache Memory : 32KB (35ns)
- Memory Bank Configurations

NO	BANK 0	BANK	BANK	BANK 3	SIZE
0	256K	0	0	0	0.5M
0	256K	256K	0	0	1M
3	256K	256K	256K	0	1.5M
4	256K	256K	256K	256K	2M
5	1M	0	0	0	2M
6	256K	1M	0	0	2.5M
7	256K	256K	1M	0	3M
8	1M	1M	0	0	4M
9	1M	1M	256K	0	4.5M
10	256K	256K	1M	1M	5M
11	1M	1M	1M	0	6M
12	1M	1M	1M	1M	8M
13	4M	0	0	0	8M
14	256K	4M	0	0	8.5M
15	256K	256K	4M	0	9M
16	1M	4M	0	0	10M
17	1M	1M	4M	0	12M
18	4M	4M	0	0	16M
19	4M	4M	256K	0	16.5M
20	256K	256K	4M	4M	17M
21	4M	4M	1M	0	18M
22	1M	1M	4M	4M	20M
23	4M	4M	4M	0	24M
24	4M	4M	4M	4M	32M

- BIOS ROM : 64K-byte

System I/O

- DMA Channels:
  8-bit operations - 4 channel
  16-bit operations - 3 channel
- Programmable Timers: 3
- Vectored Interrupt Levels: 15

System Timing

- System Clock Speed : 2QMHz (high)
  8MHz (low)
- Clock Cycle Time : 50ns (20MHz)
  125ns (8MHz)

I/O Address Map

Hex Range	Device
000-01F	8237A-5 DMA Controller #1
020-03F	8259A Interrupt Controller #1
040-05F	8254-2 Timer
060-06F	8042 (Keyboard)
070-07F	Real Time Clock NMI (Non-Maskable Interrupt) Mask
080-09F	74LS612 DMA Page Register
0A0-0BF	8259A Interrupt Controller #2
0C0-0DF	8237A-5 DMA Controller #2
0EC-0ED	Chipset register value setting
0F0	Clear Math Coprocessor Busy
0F1	Reset Math Coprocessor
0F8-0FF	Math Coprocessor
1F0-1F8	Fixed Disk
200-207	Game I/O
278-27F	Parallel Printer Port 2

Hex Range	Device
2B0-2DF	Alternate Enhanced Graphics Adapter
2E1	GPIB (Adapter 0)
2E2&2E3	Data Acquisition (Adapter 0)
2F8-2FF	Serial Port 2
300-31F	Prototype Card
360-363	PC Network (Low Address)
368-36B	PC Network (High Address)
378-37F	Parallel Printer Port 1
380-38F	SDLC, Bisynchronous 2
390-393	Cluster
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome Display and Printer Adapter
3C0-3CF	Enhanced Graphics Adapter
3D0-3DF	Color/Graphics Monitor Adapter
3F0-3F7	Diskette Controller
3F8-3FF	Serial Port 1
6E2&6E3	Data Acquisition (Adapter 1)
790-793	Cluster (Adapter 1)
AE2&AE3	Data Acquisition (Adapter 2)
B90-B93	Cluster (Adapter 2)
EE2-EE3	Data Acquisition (Adapter 3)
10EC-10ED	Remap
1390-1393	Cluster (Adapter 3)
22E1	GPIB (Adapter 1)
2390-2393	Cluster (Adapter 4)
30EC-30EF	Cache Controller
42E1	GPIB (Adapter 2)
62E1	GPIB (Adapter 3)
82E1	GPIB (Adapter 4)
A2E1	GPIB (Adapter 5)
C2E1	GPIB (Adapter 6)
E2E1	GPIB (Adapter 7)

Note: I/O address, hex 000 to FFF are reserved for the system board I/O. Hex 100 to 3FF are available on the I/O channel.

Appendix B

System Mother Board

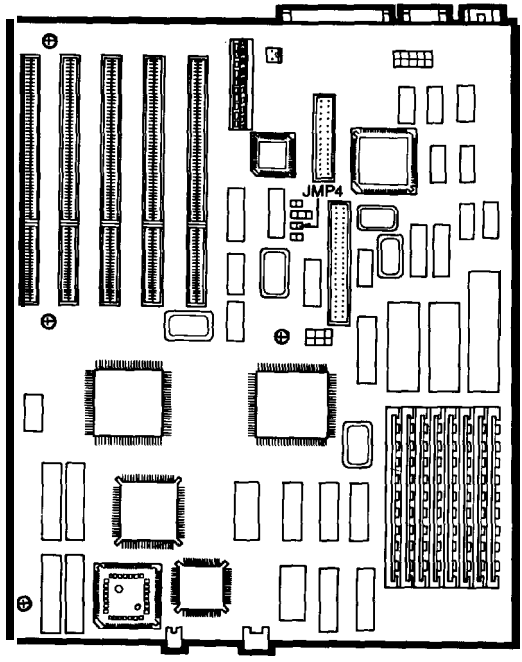


Figure B-l. System Motherboard

This appendix provides configuration and interface information for this board. You may skip this appendix if you are not installing expansion products that require changing the motherboard's configuration jumper settings.

Hardware Settings

The system motherboard provides a set of headers to set the system configuration. These are located at various points on the board. Shorting jumpers installed on the shunts control the system configuration settings.

There are several headers on the motherboard but most of them are already factory setting and you should not remove them.

> Note
> If you have problems setting the system CPU configuration headers, contact your dealer for assistance.

When you turn the system power on, the system CPU will compare these settings with the information stored in its configuration RAM as part of the diagnostic routines. If any inconsistencies are found, they will be shown on the display monitor before MS-DOS is loaded. At that time, you will be prompted to run the SETUP program to change the options stored in the configuration RAM. It is important that these settings describe the actual equipment installed on your computer system.

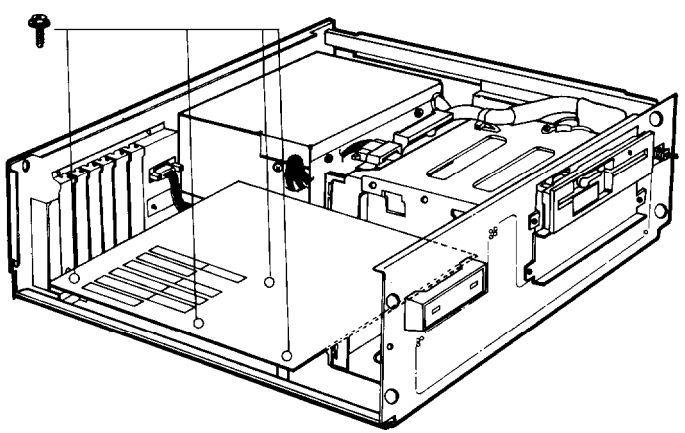


Figure B-2. Installing the Motherboard

Removing The MotherBoard

In order to change the settings defined by these jumpers, it will be necessary to remove the system motherboard from the chassis. To do this, follow these steps, referring to Chapter 7, "Expanding Your System," where necessary:

- ❑ Unplug all of the cables from the rear panel of the main system unit.
- ❑ Remove the main system unit cover.
- ❑ Remove all expansion boards from their slot connectors on the system motherboard, noting the location of each board and any internal cable connections, for re-installation later.
- ❑ Carefully unplug all of the cables connected to the system motherboard, noting their locations for later.
- ❑ Remove the several screws that attach the system motherboard to the chassis.
- ❑ Carefully slide the motherboard out of the chassis.
- ❑ To re-install the motherboard, reverse this procedure.

Headers

Once the motherboard is out of the chassis, proceed to set the configuration headers and switches to match the changes in the system hardware.

The Table B-l, lists the jumper settings

Jumper	Shunt	Open	Function
JMP 1	Don't Care		Chipset output current control
JMP 2	Don't Care		Power good circuit select
JMP 4	Color	Mono	Monitor type select
JMP 5	Don't Care		FDD operating type select
JMP 6, 7	Don't Care		ROM size select

Table B-l. Headers

Connectors

The system motherboard is provided with a number of connectors for communication with other parts of the computer system. These connectors are discussed below.

For pinout information on these connectors, see Appendix D, "Connector Pinouts."

The connectors provided on the system motherboard are for signal/power in facing and the I/O ports, as follows:

Connector	Function
JI	Indicator board connector
J2	AT keyboard connector
J4	Speaker connector
J5	Battery connector
J6	HDD LED connector
J7	IDE connector
J8	Floppy connector
J9	Serial port connector (Dshell)
JIO	Serial port connector
JII	Parallel port connector (Dshell)
J12	Power connector

Table B-2.

Expansion Slots - 521 to 530

The system board contains five expansion slots for 16-bit AT boards.

> **Caution!**
> **Do not overload the system board power connector by installing expansion boards that may draw excessive current.**

Keyboard Port - 52

The keyboard connector J2, is a 5-pin DIN connector for keyboards that are compatible with the IBM AT keyboard.

Parallel Port - J11

Connector J 11 on the system board provides a standard Centronics 25-pin parallel interface.

> **Note**
> You cm use the parallel port for LPTl or LPT2. If you have external card for parallel port on your system, you must disable the on-board parallel port via setup options. Refer to chapter 2 for detailed instructions of it.

Serial Port - J9 (8 pin DsheU), JlO (2 . 5 Straight post)

Connector J9 and Jl0 provide the standard AT-type RS-232C serial interfaces.

> **Note**
> **If you want to use external devices for serial port, you should disable the on-board serial ports via setup options. For more information, See chapter 2.**

Power Connector - J12

The system board requires four DC voltage: + 12V, - 12V, +5V, and -5V. The power connector, J12 is 12spin connector, respectively, that supply power to the system board and to the five expansion slots.

Speaker - J4

Connector J4 provides a speaker connection for audible tone generation. The connector is a two pin header.

IDE Interface connector - 57

You use this 40 pin connector with IDE type Hard disk drive.

> **Note**
> If you have another type of HDC (for example, SCSI or ESDI), you should disable the on board IDE HDC via set up program before installing it. See chapter 2 for more information.

Appendix C

Video Monitor Systems

There are many video display systems available for use with your computer system. This appendix will provide a brief description of the most common video system types, and discuss their applications.

Monitor System Resolution

The main difference between video monitor system types is their screen resolution. The monitor's resolution is important because it determines the number of characters that can be displayed on the screen at any one time, and the quality of any screen graphics displayed.

The image displayed on the video screen is made up of a large number of individual dots. This is true whether the displayed screen image is made up of text or graphics, or is a mixture of both. The higher the monitor's resolution is, the smaller the individual dots can be. Smaller dots means that more of them can be displayed in the same space. If more dots are displayed, then more text characters and better looking graphics can be displayed.

Video Controller Boards

The video controller board controls the actual number of dots sent to the screen. A video system's resolution capability is usually described as the number of dots that can be displayed horizontally by the number of dots that can be displayed vertically.

The personal computer industry has established several video controller resolution and color standards. Some of these are described below.

- Hercules Graphics Compatible (HGC):
  HGC boards have become the video controller-of-choice for basic personal computer video display monitor systems. Providing dot resolutions up to 729 x 350, HGC boards display good quality text and graphics, while using shading to accommodate color software.

- Color Graphics Adaptor (CGA):
  The original CGA boards featured very low resolution, typically 320 x 200. This was because they were originally intended home computers that were used for advanced video games. Recently, however, CGA resolution has been improved to 640~200. With the higher resolution, CGA has gained acceptance in the office environment. By using colored text screens and low-level graphics, a number of software packages have been made easier to use.

- Enhanced Graphics Adaptor (EGA):
  EGA video systems provide high resolution (640~350 maximum) color graphics capabilities. These monitor systems are often used in computer-aideddesign workstations and other software applications requiring a larger number of on-screen colors than CGA controllers can provide.

- Video Graphics Array (VGA):
  Recently, a new video standard has emerged to take advantage of the features of the multi-sync monitors. Providing up to 720~400 dot resolution, these systems have been used in applications that require the highest possible video resolution, such as desktop publishing, computer-aideddesign (CADICAE), and broadcast quality computer graphics.

The maximum screen resolutions of the different video standards is summarized below, along with their color and graphics features:

- HGC:
  maximum dot resolution:
    720x350
  maximum text display:
    80 columns x 25 lines
  colors:
    monochrome green or amber

- CGA:
  dot resolution:
    640 x 200
  maximum text display:
    80 columns x 25 lines
  colors:
    2 of 16 colors (640 x 200)
    4 of 16 colors (320x200)

- EGA:
  dot resolution:
    640x350
  maximum text display:
    80 columns X 43 lines
  colors:
    16 of 64 colors

- VGA:
  dot resolution:
    720~400 (text only)
    640~480 (text and graphics)
  maximum text display:
    80 columnsx50 lines
  colors:
    16 of 262,144
    256 of 262,144 (320x200 res)

Note
EGA and VGA controller boards are available with higher resolutions than the maximum defined by the standards. The optional EGA video system for this computer provides up to 1056×352 dot resolution for a text display of 132 columns×44 lines, and up to 800×600 resolution for color graphics.

Monitor Types

There are many different types of video monitor available. Some of the major ones are described below.

- Composite Video:
  With a 300 x 200 resolution, this type of monitor is usually used with home computers. They are not recommended for use with your system.

- TTL Monochrome:
  These monitors provide up to 1000~350 resolution, with either a green or amber colored screen. Primarily intended for text only applications, these monitors can run Hercules-compatible graphics programs, although applications requiring full CGA or EGA color compatibility will be difficult, if not impossible, to use. A TT'L monochrome monitor and a Hercules compatible controller board will meet your computer system's basic video display monitor needs.

- RGB Color:
  RGB stands for Red, Green and Blue, and indicates that each of the primary colors are separately driven by the video controller board. RGB monitors cover a broad range of resolutions from 320 x 200 up to the higher EGA ranges of 720~480. RGB color monitors are very

useful in applications that need good-looking graphics, or higher resolution text, though they are limited in the number of colors that can be displayed at a given time. if you are going to be using software that requires color, but not high resolution graphics, you should use an RGB video display monitor, connected to a CGA video controller board. If your software requires high resolution graphics, use an EGA controller board instead.

- Multi-sync:

  Multi-sync monitors are so named because they are able to adjust themselves to any standard video format. Providing resolutions up to 1400x 1200, multi-sync video monitors are used with software that needs very high resolution color graphics. Connecting your computer to a multi-sync monitor by way of either an EGA or VGA controller board provides one of the highest resolution computer video systems available. This type of system is used for such applications as very high resolution CAD/CAE workstations, computer graphics design and desktop publishing.

Appendix D
Connector Pinouts

I/O Ports

0 RS-232C Serial port
(9-pin subminiature "D" connector):

Pin #	I/O Type:	Signal Name:
1	Input	Carrier Detect (CD)
2	Input	Receive Data (RD)
3	Output	Transmit Data (TxD)
4	Output	Data Terminal Ready (DTR)
5	Ground	Singal Ground (GND)
6	Input	Data Set Ready (DSR)
7	Output	Request to Send (RTS)
8	Input	Clear to Send (CTS)
9	Input	Ring Indicator (RI)

Note
All signals conform to EIA Standard RS-232C.

❑ Centronics-compatible paralle printer port (25pin subminiature "D" connector):

Pin #	I/O Type:	Signal Name:
1	Input	–Strobe
2	Output	Data Bit 0
3	Output	Data Bit 1
4	Output	Data Bit 2
5	Output	Data Bit 3
6	Output	Data Bit 4
7	Output	Data Bit 5
8	Output	Data Bit 6
9	Output	Data Bit 7
10	Output	–Acknowledge
11	Output	Busy
12	Output	Paper Out
13	N/A	Select
14	Input	–Autofeed
15	I/O	–Error
16	Input	–Initialize Printer
17	Input	–Select Printer
18-25	Ground	GND

Note
1. All outputs are software generated All inputs are **rea-time signals (not latched).**

2. All signals are TTL compatible.

❑ Keyboard Port (S-pin mini "DIN" connector)

Pin #	Signal Name
1	Keyboard clock
2	Keyboard data
3	Reserved
4	Ground
5	+5V

❑ IDE Port

Pin #	Signal Name
1	–Reset
2	Ground
3	Data 7
4	Data 8
5	Data 6
6	Data 9
7	Data 5
8	Data 10
9	Data 4
10	Data 11
11	Data 3
12	Data 12
13	Data 2
14	Data 13
15	Data 1
16	Data 14
17	Data 0
18	Data 15
19	Ground
20	Key
21	Not Connected
22	Ground
23	–IOW
24	Ground
25	–IOR
26	Ground
27	Not Connected
28	–ALE
29	Not Connected
30	Ground
31	IRQ 14
32	–IOCS 16
33	A1
34	Not Connected
35	A0
36	A2
37	–CS0
38	–CS1
39	–Active
40	Ground

❑ Power Supply Connector (12-pin post header)

Pin #	Signal Name
1	Power Good Signal
2	+5 Volts
3	+12 Volts
4	-12 Volts
5	Ground
6	Ground
7	Ground
8	Ground
9	-5 Volts
10	+5 Volts
11	+5 Volts
12	+5 Volts

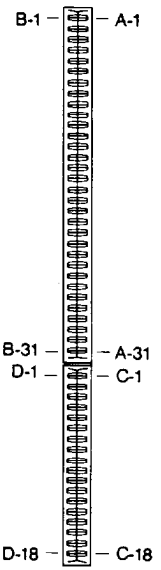


Figure D-l. Expansion Slot Connectors

Expansion Slot Connectors

Your computer comes with industry standard IBM compatible expansion slots. There are five At-style (98 pin) expansion slot connectors mounted on your system mother board. The charts below show the pin numbering on the expansion slot connectors.

❑ Expansion Slot Connector Pinouts:

Pin #	I/O Type:	Signal Name:
A-1	Input	–I/O CH CK
A-2	I/O	SD7
A-3	I/O	SD6
A-4	I/O	SD5
A-5	I/O	SD4
A-6	I/O	SD3
A-7	I/O	SD2
A-8	I/O	SD1
A-9	I/O	SD0
A-10	Input	–I/O CH RDY
A-11	Output	AEN
A-12	I/O	SA19
A-13	I/O	SA18
A-14	I/O	SA17
A-15	I/O	SA16
A-16	I/O	SA15
A-17	I/O	SA14
A-18	I/O	SA13
A-19	I/O	SA12
A-20	I/O	SA11
A-21	I/O	SA10
A-22	I/O	SA9
A-23	I/O	SA8
A-24	I/O	SA7
A-25	I/O	SA6
A-26	I/O	SA5
A-27	I/O	SA4
A-28	I/O	SA3
A-29	I/O	SA2
A-30	I/O	SA1
A-31	I/O	SA0

❑ Expansion Slot Connector Pinouts (continued):

Pin #	I/O Type:	Signal Name:
B-1	Ground	GND
B-2	Output	RESET DRV
B-3	Power	+5 VDC
B-4	Input	IRQ9
B-5	Power	–5 VDC
B-6	Input	DRQ2
B-7	Power	–12 VDC
B-8	Input	OWS
B-9	Power	+12 VDC
B-10	Ground	GND
B-11	Output	–SMEMW
B-12	Output	–SMEMR
B-13	I/O	–IOW
B-14	I/O	–IOR
B-15	Output	–DACK3
B-16	Input	DRQ3
B-17	Output	–DACK1
B-18	Input	DRQ1
B-19	I/O	–REFRESH
B-20	Output	CLK
B-21	Input	IRQ7
B-22	Input	IRQ6
B-23	Input	IRQ5
B-24	Input	IRQ4
B-25	Input	IRQ5
B-26	Output	–DACK2
B-27	Output	T-C
B-28	Output	BALE
B-29	Power	+5 VDC
B-30	Output	OSC
B-31	Ground	GND

❑ Expansion Slot Connector Pinouts (continued):

Pin #	I/O Type:	Signal Name:
C-1	I/O	–SBHE
C-2	I/O	SA23
C-3	I/O	SA22
C-4	I/O	SA21
C-5	I/O	SA20
C-6	I/O	SA19
C-7	I/O	SA18
C-8	I/O	SA17
C-9	I/O	–MEMR
C-10	I/O	–MEMW
C-11	I/O	SD8
C-12	I/O	SD9
C-13	I/O	SD10
C-14	I/O	SD11
C-15	I/O	SD12
C-16	I/O	SD13
C-17	I/O	SD14
C-18	I/O	SD15
D-1	Input	–MEM CS16
D-2	Input	–I/O CS16
D-3	Input	IRQ10
D-4	Input	IRQ11
D-5	Input	IRQ12
D-6	Input	IRQ15
D-7	Input	IRQ14
D-8	Output	–DACK0
D-9	Input	DRQ0
D-10	Output	–DACK5
D-11	Input	DRQ5
D-12	Output	–DACK6
D-13	Input	DRQ6
D-14	Output	–DACK7
D-15	Input	DRQ7
D-16	Power	+5 VDC
D-17	Input	–MASTER
D-18	Ground	GND

Appendix E
Advanced ROM Diagnostics

Introduction

In addition to the POST diagnostics which are performed during power-up, the ROM BIOS also has an advanced diagnostics program which can perform specialized tests on each of the following when instructed:

- Hard disk drive(s)
- Floppy diskette drive(s)
- Keyboard
- Video adapter board and monitor
- Printer and communication ports

This section contains descriptions of operation for all the tests available through this program located in the ROM BIOS. Included here also are possible error messages.

When to Run Advanced Diagnostics

Advanced ROM Diagnostics can be run whenever a device or controller malfunction is suspected. These tests are especially useful when floppy diskette-based diagnostics, are either unavailable or unusable because the floppy disk drive or floppy controller appear to be malfunctioning.

Starting Advanced ROM Diagnostics

To access the Advanced ROM BIOS Diagnostics, perform the following:

> **Note**
> Before working with the Advanced ROM diagnostics, make certain that all peripheral devices and the AC power cord from the host computer are connected properly.

- Turn on the on/off switch at the front of the unit. When the system first starts and the memory tests have been completed, this message displays briefly for your decision (respond as indicated in the brackets):

```
Press <DEL> to run SETUP or DIAGS
```

Press <DEL > .

> Note
> If you do not press the <DEL> key after a few seconds, the system finishes the start-up process and attempts to find an operating system. After a few more seconds, the system offers the user a second opportunity to enter diagnostics:

```
EXIT FOR BOOT
RUN CMOS SETUP
RUN DIAGNOSTICS
```

Set the reverse video cursor on the option "RUN DIAGNOSTICS" and Enter.

The following screen should appear:

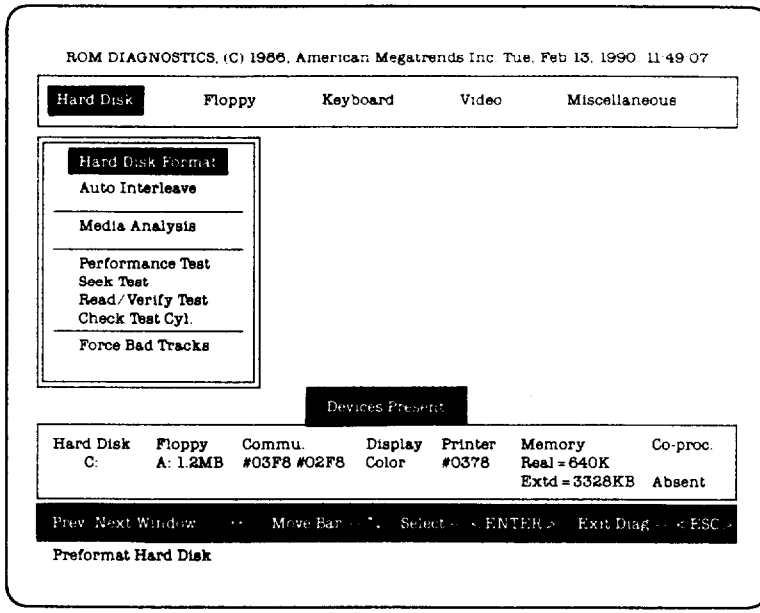


Figure E-l. Starting Advanced ROM Diagnostics

The screen is divided into six (6) sections. From top to bottom, these are:

- **The Signature Line.** This line includes the title of the program, the copyright, the name of the company which designed the program, the date, and the time in military format.
- **The Diagnostics Options Line.** This is where the user chooses the device/adapter to be tested. The options are: Hard Disk, Floppy Disk, Keyboard, Video, and Miscellaneous (Printer and Communications). Each device option on the Diagnostics Option Line has its own Diagnostics Options Window which appears whenever the device option is highlighted. Device options are highlighted by pressing the right or left arrow (cursor movement) keys located on the numeric keypad.

- **The Diagnostics Options Window.** Below the Diagnostics Options Line is the Diagnostics Options Window for that option, The test options available in each Diagnostics Options Window are addressed in the following pages under the appropriate diagnostics heading (Hard Disk, Floppy Disk, Keyboard, Video, and Miscellaneous).

- **The configuration of the system in the Devices Present section of the screen.** This section identifies the types of devices present in the system. Below each device type appears an identifying characteristic, symbol, or code. If a device listed on this line is not currently a part of the system, "Absent" appears below the name of the device type.

- **The Guide Line in reverse video explains how to use the arrow directin (cursor) keys, the ENTER key, and the ESC key.** Use the Left and, Right arrow keys to move in the Diagnostics Options Line. Use the Up & Down arrow keys to move within a Diagnostics Options Window. Use the ENTER key to select the option in the Diagnostics Options Window. Press < **ESC** > to abort and return to the previous menu.

- **Test Function Line.** This line briefly describes the function of the test highlighted in the Diagnostics Options Window.

Advanced ROM Diagnostics Tests

This portion of the section addressing Advanced ROM Diagnostics describes in detail each test which can be performed from the Advanced Diagnostics Screen. These tests are addressed in the following order: Hard Disk Tests, Floppy Disk Tests, Keyboard Tests, Video Adapter and Monitor tests, Printer and Communication Port tests. The possible error messages encountered while running these tests are addressed in each set of tests.

Hard Disk Diagnostics

The following tests can be performed on your hard disk(s): 1) Hard Disk Format, 2) Auto Interleave, 3) Media Analysis, 4) Performance Test, 5) Seek Test, 6) Read/Verify Test, 7) Check Test Cylinder Test, 8) Force Bad Tracks.

> **Note**
> The following tests are valid only if the if disk being: tested is not a SCSI device: 1) Hard Disk Format, 2) Auto Interleave, 3) Media Analysis, and 4) Force Bad Tracks. These tests are not valid for a SCSI Fixed Disk Drive.

> Warning!
> Performing the following tests will destroy and data on the hard disk being tested: Hard Disk Format, Auto Interleave, and Media Analysis,

Error Messages

There are two types of error messages that can be generated as a result of performing the Hard Disk tests. These are diagnostics-generated error messages, and controller-generated error messages.

Diagnostics Generated Error Messages

```
INSUFFICIENT MEMORY FOR DATA TRANSFER
Minimum Memory REquired is - 128KB
```

This error message is generated by the Performance Test procedure which requires at least 128KB of RAM space. So, if your system board has less than 128KB of available RAM space, you cannot use this function.

Controller Generated Error Messages

The controller generated error messages encountered while performing any of the hard disk functions are displayed in a window with 2 lines:

```
Line 1          *** ERROR ***
Line 2          The actual error message
```

The actual error message could be any of the following:

- Address mark not found
- Requested sector not found (Sector not found)
- Reset failed
- Drive parameter activity failed
- Bad sector flag detected
- Bad ECC on disk read (Unrecoverable error checking and correction (ECC) or cyclic redundancy check (CRC) error)
- ECC corrected data error
- Controller has failed (General controller failure)
- Seek operation failed
- Attachment failed to respond (Time out error)
- Write fault on selected drive

The Hard Disk Format Test

Warning!
The Hard Disk Format Test is a destructive operation. Back up the hard disk(s) on which this routine will be performed before actually performing the operation.

Note
This test is not valid for a SCSI drive.

Use the Hard Disk Format Test to 1) integrate a new hard disk to the system, or 2) reformat a used hard disk which has developed some bad patches as a result of aging or poor handling.

After entering the Advanced ROM Diagnostic program, the following screen will appear. "Hard disk" is highlighted with a block cursor in the main menu. Below this horizontal menu is another menu which lists all available hard disk tests. "Hard Disk Format" is highlighted in this menu when it first appears on the screen.

To perform a Hard *Disk* Format *Test:*

- Press **< ENTER >** . The causes the following information boxes to appear.

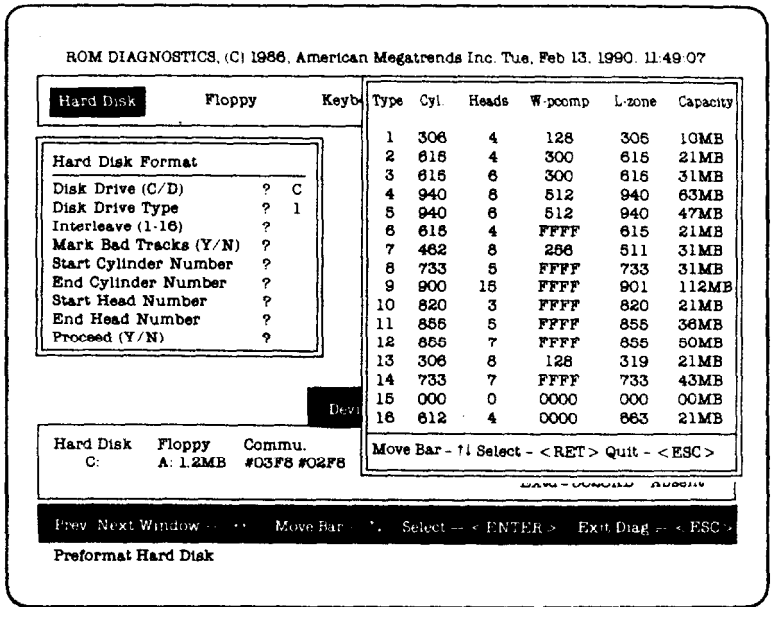

ROM DIAGNOSTICS, (C) 1986, American Megatrends Inc. Tue, Feb 13, 1990. 11:49:07
Hard Disk
Floppy
Keyb
Hard Disk Format
Disk Drive (C/D) ? C
Disk Drive Type ? 1
Interleave (1-16) ?
Mark Bad Tracks (Y/N) ?
Start Cylinder Number ?
End Cylinder Number ?
Start Head Number ?
End Head Number ?
Proceed (Y/N) ?
Type Cyl. Heads W-pcomp L-zone Capacity
1 306 4 128 306 10MB
2 615 4 300 615 21MB
3 615 6 300 615 31MB
4 940 8 512 940 63MB
5 940 6 512 940 47MB
6 615 4 FFFF 615 21MB
7 462 8 256 511 31MB
8 733 5 FFFF 733 31MB
9 900 15 FFFF 901 112MB
10 820 3 FFFF 820 21MB
11 855 5 FFFF 855 36MB
12 855 7 FFFF 855 50MB
13 306 8 128 319 21MB
14 733 7 FFFF 733 43MB
15 000 0 0000 000 00MB
16 612 4 0000 663 21MB
Move Bar - ↑↓ Select - <RET> Quit - <ESC>
Hard Disk C:
Floppy A: 1.2MB
Commu. #03F8 #02F8
Prev Next Window
Move Bar
Select - < ENTER >
Exit Diag - < ESC >
Preformat Hard Disk

Figure E-2. Performing A Hard Disk Format Test: Entering the Disk Drive Type

The box on the left contains a series of questions (fields) which must be answered before performing the Hard Disk Format Test. The answers are entered to the right of the question mark. The first question will already be answered for you as long as a value has been previously entered at the CMOS Setup screen. This value is 0 for a 'C' drive and 1 for a 'D' drive. If the disk drive ID (CID) has been previously entered at the CMOS Setup Screen, then the ID (C/D) will appear to the right of the question mark following the "Disk Drive (C/D)" field. If this information has not been entered, then enter the appropriate response now.

Disk Drive Type

After entering the appropriate response (if it hasn't already been entered) the default value (1, if the drive was not entered during the CMOS Setup) for "Disk Drive Type" will appear to the right of the "?" following the "Disk Drive Type" field. The cursor blinks to the right of the "?," prompting for either a new value, or acceptance of the default value, by pressing < E N T E R > .

> Note
> Values entered during the Advanced ROM Diagnostics tests are not retained by the CMOS Setup program. These values are valid in the system for the period of the test only unless they are entered at the CMOS Setup screen. The CMOS Setup program is addressed earlier in this tab in a separate section.

The information box to the right contains a listing of 47 possible drive types. The first 16 are visible when the box first appears. Entries 17 through 47 are visible by scrolling through the list using the up and down arrow keys. The 47th entry is called the USER definition entry.

> **Note**
> The USER definition entry allows you to perform a test on a disk drive not defined in ROM. The USER definition entry is valid only during the period that the test is performed.

These 47 different drive types are identified by the following characteristics:

- Type — This is the number designation for a drive with certain identification parameters.
- cyl. — This is the number of cylinders found in the specified drive type.
- *Heads* — This is the number of heads found in the specified drive type.
- *W-pcomp* — W-pcomp is the read delay circuitry, which takes into account the timing differences between the inner and outer edges of the surface of the disk platter. The number designates the starting cylinder of the signal.
- *L-zone* — L-zone is the landing zone of the heads. This number determines the cylinder location where the heads will normally park when the unit is shut down.
- *Capacity* — This is the formatted capacity of the drive based on the following formula:

  # of heads x # of cylinders x 17 secs/cyl. x 512 bytes/sec.

To choose a drive type, use the up and down arrow keys. The bar cursor highlights each selection in sequence. The type value (147) of your highlighted selection will automatically appear in the Hard Disk Format information box. When you are satisfied with your selection, press < ENTER > . This moves the cursor to the next field.

Note
To leave the Hard Disk Format information box before making a selection, press < ESC > .

Interleave Factor

After pressing **<ENTER >** at the "Disk Drive type" field, the cursor will blink below either the default value or the previous value entered for the "Interleave (1-16)" field. The default value is the previous value determined by Auto Interleave. Type the desired value and press <ENTER > . The cursor will move to the next field, "Mark Bad Tracks (Y/N)."

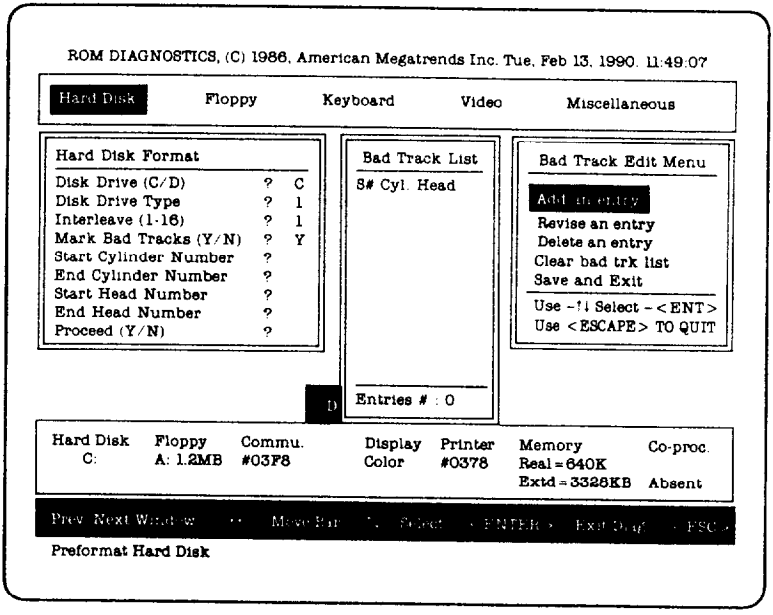


Figure E-3. Performing A Hard Disk Format Test: Marking Bad Tracks

Mark Bad Tracks

The default value is 'N' for 'No'. If the hard disk being tested is not a SCSI device, check the unit for a manufacturer's list of bad tracks. If this information is available, type 'Y' and press **< ENTER>** . Another informatin box, titled "Bad Track List," appears to the right of the "Hard Disk Format" box. Below the heading are three columns for 1) the entry number (S#), the cylinder number (Cyl.), and the head number (Head). At the bottom of the box, the number of track % entries are tallied. To the right of the Bad Track List box is the Bad Track List Edit Menu. This also apears when entering 'Y' at the Mark Bad Tracks (Y/N) field in the Hard Disk Format box. At the Bad Track Edit Menu, you can 1) add an entry, 2) revise an entry, 3) delete an entry, 4) clear the bad track list, and 5) save and exit. The Bad Track Edit Menu is described here.

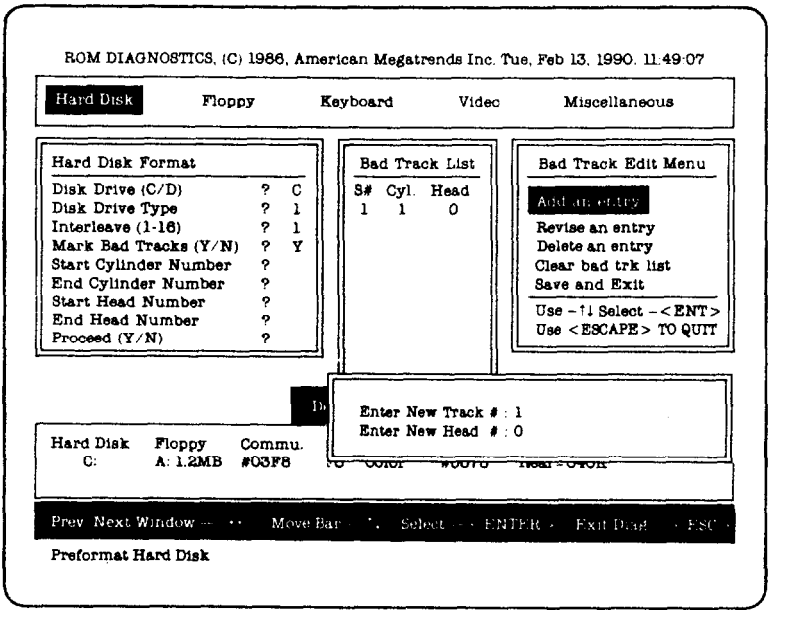


Figure E-4. Performing A Hard Disk Format Test: The Bad Track Edit Menu

- Add an entry

With the block cursor highlighting "Add an entry," press **< ENTER>** . This will cause another box to appear below the Bad Track Edit Menu. This box asks you to enter the track number for the entry you wish to add. When the box first appears, either the default (0) value or the previous value entered will appear. The cursor will blink below the value, prompting you to either accept the value by pressing **< ENTER >** , or enter a new value. After pressing **< ENTER>,** the cursor will prompt you to enter a value for head number. You may accept the default value (0), or the previous value entered, by pressing **< ENTER > .** To change this value, type a new value and press **< ENTER > . The** entry box will disappear and the block cursor will once again highlight "Add an entry" in the Bad Track Edit Menu. To add more entries, press **< ENTER > .**

The program will not accept dual entries. Attempting to enter dual entries will prompt the box to display the message, "Entry already present, enter again." The cursor will return to the track number field, prompting you for a new value. Entries are listed in the Bad Track List box.

- Revise an entry

Using the down arrow key, move the block cursor to "Revise an entry" in the Bad Track Edit Menu. Press **< ENTER > .** The last entry in the Bad Track List will be highlighted with the block cursor. To select an entry for revision, use the up and down arrow keys to highlight the desired selection. Press **< ENTER >** . The entry box will disappear and the block cursor will once again highlight "Add an entry" in the Bad Track Edit Menu. To add more entries, press **< ENTER > .**

The Enter New Track # and Head # box will appear with the current track # (Cyl.) value entered in the field to the right of "Enter New Track #." Type in a new value (if desired) at the blinking cursor, and press **< ENTER >** . Enter a new value at "Enter New Head #." The program will not accept dual entries. All values must not exceed the corresponding cylinder and head values for the disk drive type entered at that field.

- Delete an entry

Using the up and down arrow keys, move the cursor bar until "Delete and entry" is highlighted. Press **< ENTER > . The** last entry in the Bad Track List box is highlighted. Use the up and down arrow keys to highlight the entry you wish to delete. After highlighting the desired entry you wish to delete, press < ENTER> to delete it. The entry box will disappear and the block cursor will once again highlight "And an entry" in the Bad Track Edit Menu. To add more entries, press **< ENTER > .**

- Clear the Bad Track Lis

Using the up and down arrow keys, move the cursor bar until "Clear bad trk list" is highlighted. To clear the list in the Bad Track List box, press < ENTER > .

- Save and Exit

When you are ready to save the information in the Bad Tracks List **box,** press **< ENTER >** . The edit menu will disappear and the cursor returns to the "Start cylinder number" field in the Hard Disk Format information box.

Start Cylinder Number

See Figure E-2.

Enter the cylinder number where you want the formatting to begin. The default value is '0'.

End Cylinder Number

See Figure E-Z.

Enter the cylinder number where you want the formatting to end. The default value is the last cylinder in the drive.

Start Head Number

See Figure E-2.

Enter the head number where you want the formatting to begin in the cylinders specified in the previous two fields. The default value is '0'.

End Head Number

See Figure E-2.

Enter the cylinder number where you want the formatting to end. The default value is the last head in each cylinder.

Proceed

If all the previous entries contain the appropriate values, then press 'Y'. If 'N' is entered here, the cursor will return to the Disk Drive Type field. When you are satisfied with the values entered at each field, enter 'Y' at the Proceed field. A WARNING message appears:

```
All data on harddisk you have specified
may be LOST...

Do you still want to continue (Y/N)?
```

After you enter 'Y', the Activity box appears on the right side of the screen. "Format" is highlighted in the Activity box. In the Status portion of the Activity box, the specified cylinders, heads, and sectors are displayed sequentially as they are formatted.

> Note
> The test can be aborted at an): time by pressing the <ESC> key.

When the test is aborted or finished, press <ENTER> to return to the main menu.

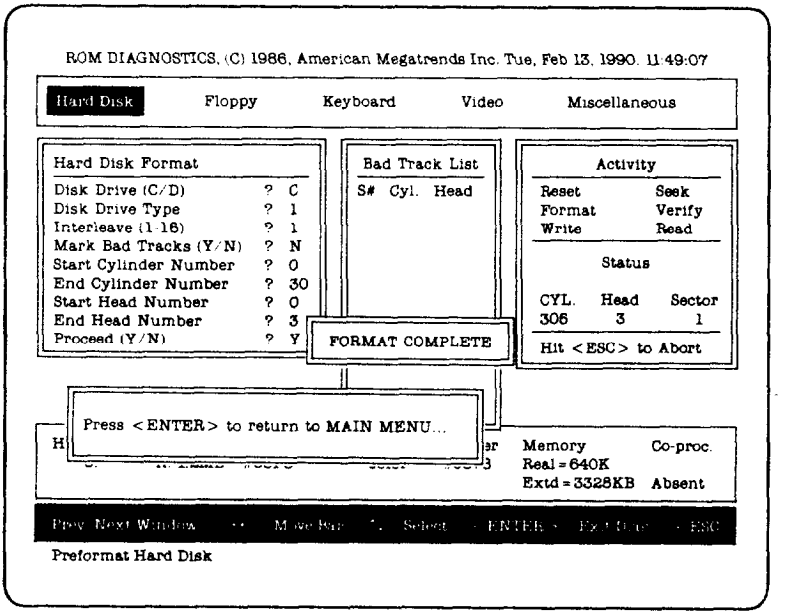


Figure E-5. Initiating the Hard Disk Format Test

Auto Interleave Routine

Warning!
The Auto Interleave Routine is a destructive operation. Back up the hard disk(s) on which this routine will be performed before actually performing the operation.

Note
This test is not valid for a SCSI drive.

Run the Auto Interleave Routine to optimize hard disk performance. This routine actually occurs in two separate steps. First, the BIOS will calculate the optimum interleave value through trial and error by measuring the transfer rate for four different interleave values. During this process, a portion of the hard disk is formatted to determine the best interleave value. The BIOS will then format the hard disk using this interleave factor. If a list of bad tracks is required before formatting the hard disk, press < **ESC** > to abort the second part of the test. Then, press **<ENTER** > to return to the main menu. Perform the Hard Disk Format Test. To perform the Auto Interleave Routine:

- At the Hard Disk menu, highlight "Auto Interleave" using the bar cursor. Then, press < **ENTER** > . That causes the Auto Interleave Detection box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These responses are addressed earlier in this tab under the heading "Hard Disk Format Test."

```
Disk Drive C/D                    ?
Disk Drive Type                   ?
Proceed (Y/N)                     ?
```

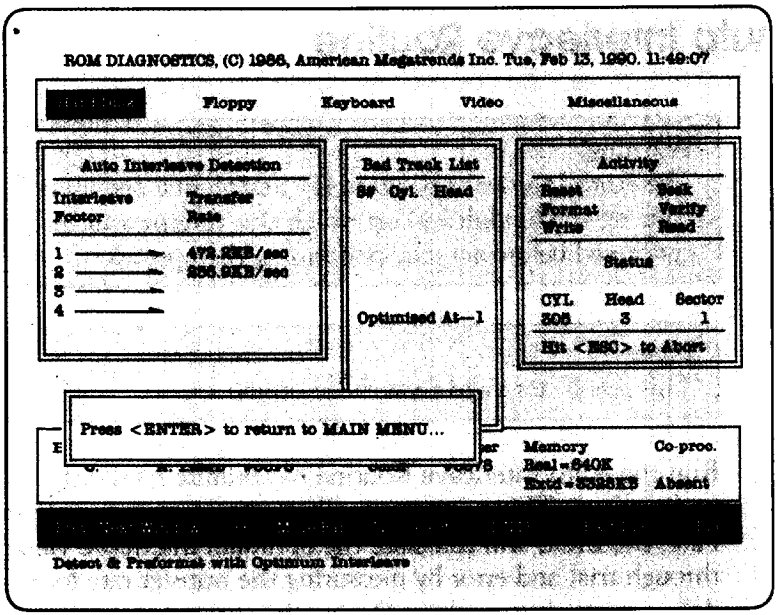
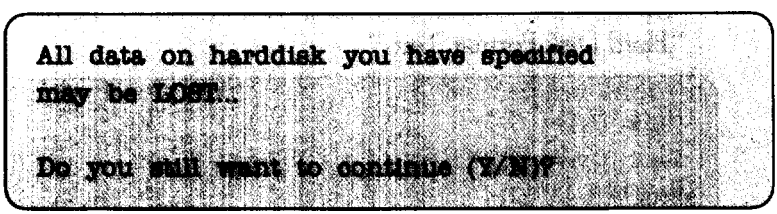


Figure E-6. The Auto Interleave Routine

If you want to change a response to one or both of these fields before running the test, enter "N" at the "Proceed" field. This will return the cursor to the Disk Drive Type field unless the Disk Drive ID (C/D) has not been previously entered at the CMOS Setup screen. If this has not been done, the cursor will prompt you for an appropriate response at this field first.

After you have entered the appropriate information at the first two fields, enter Y at the "Proceed" field. A WARNING box will appear on the screen:



Entering "N" returns you to the Auto Interleave Routine Information Box. Entering "Y" causes the following information boxes to appear: 1) Auto Interleave Detection, 2) Bad Track List, and 3) Activity. In the Auto Interleave Detection box, the transfer rate is calculated for up to four (4) different interleave factors. These interlelave factors are 1-4. The Bad Track List box displays the status of the routine. At different times during the routine, the following messages will be displayed in this box:

```
Formatting.....
Measuring.....
Optimised At —
```

To determine the best interleave factor, the system will format a portion of the hard disk for each transfer rate calculated. The cylinders, heads and sectors formatted for each value during this first part of the test are displayed in the Activity box. "Format," highlighted in the uppér part of the box, flickers to indicate that the cylinders, heads and sectors displayed below are being formatted.

After the optimum interleave factor has been determined, the Bad Tracks List will display the optimum interleave factor:

```
Optimised At — ?
```

This initiates the second part of the test. A hard disk format test is performed on the entire hard disk using the optimum interleave factor. The Activity box displays the formatting activity of the hard disk by cylinder, head and sect& number. The test can be aborted at any time by pressing < ESC > . When the test isfinished or aborted, press <ENTER> to 'return to the main menu.

Media Analysis Test

Warning!
The Media Analysis Test is a destructive operation. Back up the hard disk(s) on which this routine will be performed before actually performing the operation.

Note
This test is not valid for a SCSI drive.

The Media Analysis Test performs a series of tests to locate bad patches. Even though you may have a list of bad patches from the manufacturer, this will not list any new bad patches which may have developed as a result of aging or poor handling. This test locates all bad tracks on the hard disk and lists them in the Bad Track List box. Since this test writes from all cylinders and heads on the hard disk to verify any bad tracks, this test may require several minutes to complete. For best results, run this test to its entirety.

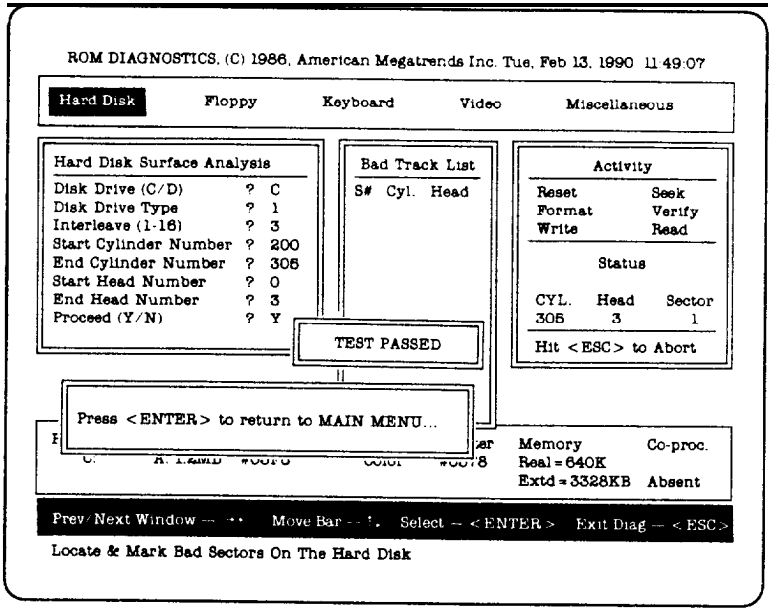


Figure E-7. The Media Analysis Test

To run the Media Analysis Test:

At the Hard Disk Menu, highlight "Media Analysis." Press **< ENTER >** . Fill in the appropriate response for each of the following fields in the Hard Disk Surface Analysis information box:

Disk Drive (C/D)	?
Disk Drive type	?
Interleave (l-16)	?
Start cylinder number	?
End cylinder number	?
Start Head number	?
End Head number	?
Proceed (Y/N)	?

Each of these fields are described earlier in this tab under the heading "Hard Disk Format Test."

When you have filled the first seven fields with an appropriate response, enter "Y" in the Proceed field. The following WARNING message will appear:

```
All data on harddisk you have specified
may be LOST...

Do you still want to continue (Y/N)?
```

The Bad Track List with all current entries, and the Activity box will also appear at this time. Entering N will return the cursor to the Disk Drive Type field in the Hard Disk Surface Analysis information box. Entering Y will initiate the test.

While the test is performed, Write and Verify are highlighted with a block cursor in the Activity box. These words flash during the test. The status line below displays the cylinder, head and sector numbers as they are written and verified.

Note
The test can be aborted at any time by pressing the <ESC> key.

Press < ENTER > to return to the main menu.

Hard Disk Performance Test

> **Note**
> Before performing the Hard Disk Performance Test, optimize the Interleave factor. See Auto Interleave Routine earlier in this tab for instructions.

The Performance Test determines the Data Transfer Rate and the Track to Track Seek time based on transfer size, seek count and data transferred. Data Transfer Rate is measured in kilobytes per second. Track to Track Seek Time is measured in milliseconds. To determine the transfer rate, the CPU reads 64KB blocks 15 times. Then, the CPU reads the number of timer ticks. Transfer rate is calculated by multiplying 64KB by 15, multiplying this value by 18.2 (# of times the timer interrupt counts in 1 set) and dividing this value by the number of system timer ticks. Track to Track Seek Time is calculated by multiplying the number of ticks by 1000, and dividing this value by 18.2 times/set x the number of Seeks **(200).**

$$\text{Transfer rate} = \frac{64\text{KBx } 15 \text{ timesx } 18.2 \text{ times/sec}}{\#\text{ system timer ticks}} = \text{KB/sec}$$

$$\text{Seek Time} = \frac{\#\text{ timer ticksx } 1000}{18.2 \text{ times/secx } 200 \text{ Seeks}} = \text{millisecs}$$

The table below lists acceptable and unacceptable values for these tests when performed on the two SCSI fixed drive options. This information is calculated and displayed in the Harddisk Performance Test Information box on the right side of the screen.

To perform the Hard Disk Performance Test:

At the Hard Disk Menu, highlight "Performance Test." Press **< ENTER >** . Fill in the appropriate response for each of the following fields in the Hard Disk Performance Test information box:

```
Disk Drive (C/D)                    ?
Disk Drive Type                     ?
Proceed (Y/N)                       ?
```

Each of these fields is described earlier in this tab under the heading "Hard Disk Format Test."

When you have filled the first two fields with an appropriate response, enter "Y" in the Proceed field. This initiates the test. When the test is completed, press **< ENTER >** to return to the main menu.

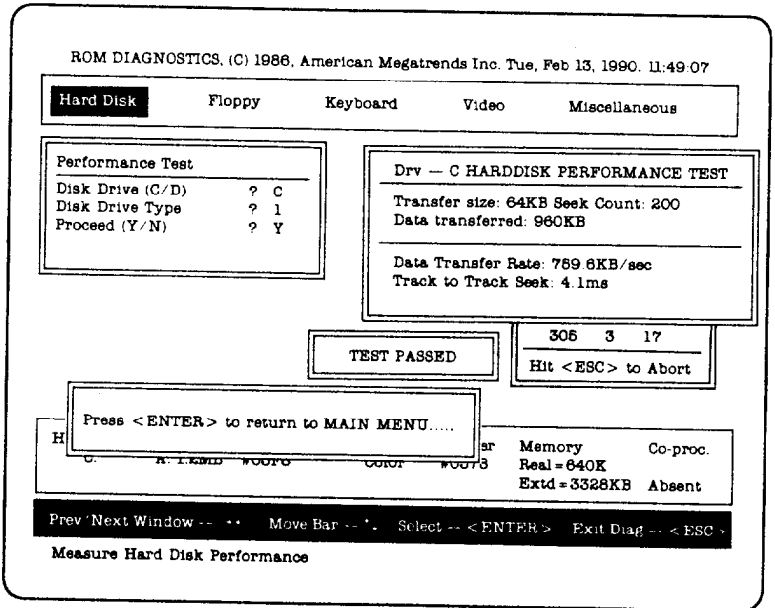


Figure E-8. Hard Disk Performance Test

Seek Test

The Seek Test determines the seek capability of the hard disk on the specified cylinder and head range. First, a sequential seek is performed, followed by a random seek. Any errors occurring during this test are displayed.

To perform a Seek Test:

At the Hard Disk Menu, highlight "Seek Test." Press **< ENTER >** . Fill in the appropriate response for each of the following fields in the Seek Test information box:

Disk Drive (C/D)	?
Disk Drive Type	?
Start cylinder number	?
End cylinder number	?
Start Head number	?
End Head number	?
Proceed (Y/N)	?

Each of these fields are described earlier in this tab under the heading "Hard Disk Format Test."

When you have filled the first six fields with an appropriate response, enter "Y" in the Proceed field. This will cause the Activity box to appear on the right side of the screen. As the test is performed, the cylinder numbers, head numbers, and sector numbers are first displayed sequentially to the specified range, then randomly displayed. "Seek" is highlighted with a block cursor in the Activity box, and flashes during the entire process. To abort the test, press **< ESC >** . When this test is aborted or finished, press **< ENTER >** to return to the main menu.

Note
Entering "N" in the Proceed field will cause the cursor to return to the Disk Drive Type field.

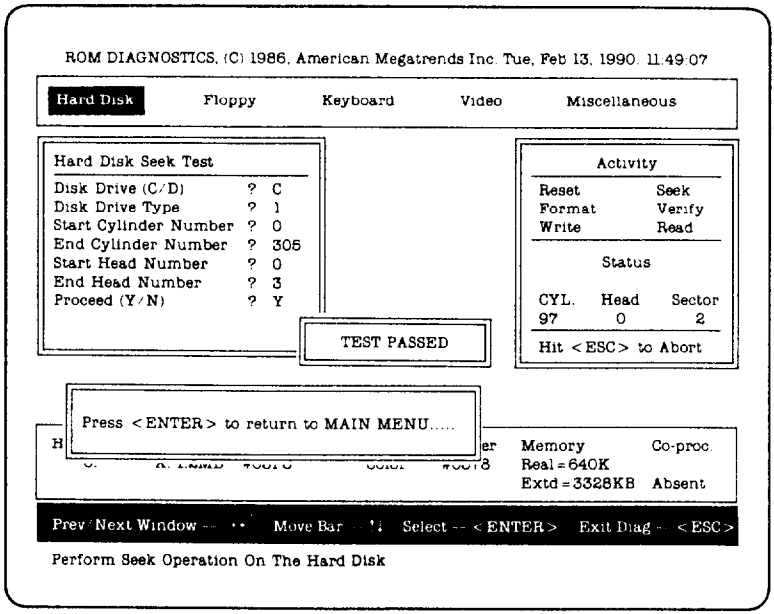


Figure E-9. Performing the Seek Test

Hard Disk Read/Verify Test

This test performs sequential and random read and verify operations on the cylinder and head range specified in the Hard Disk Read/Verify Test Information box.

To perform the Hard Disk Read/Verify Test:

At the Hard Disk Menu, highlight "Hard Disk Read/Verify Test." Press **< ENTER >** . Fill in the appropriate response for each of the following fields in the Hard Disk Read/Verify Test information box:

Disk Drive (C/D)	3
DISK Drive Type	**7**
Start cylinder number	7
End cylinder number	?
Start Head number	?
End Head number	?
Proceed (Y/N)	?

Each of these fields are described earlier in this tab under the heading "Hard Disk Format Test."

When you have filled the first six fields with an appropriate response, enter "Y" in the Proceed field. This will cause the Activity box to appear on the right side of the screen. As the test is performed, the cylinder numbers, head numbers, and sector numbers are first displayed sequentially to the specified range, then randomly displayed. "Seek" is highlighted with a block cursor in the Activity box, and flashes during the entire process.

Note
To abort this test, **press < ESC > .**

When this test is aborted or finished, press **< ENTER >** to return to the main menu.

Note
Entering "N" in the Proceed field will cause the cursor to return to **the Disk Drive Type field.**

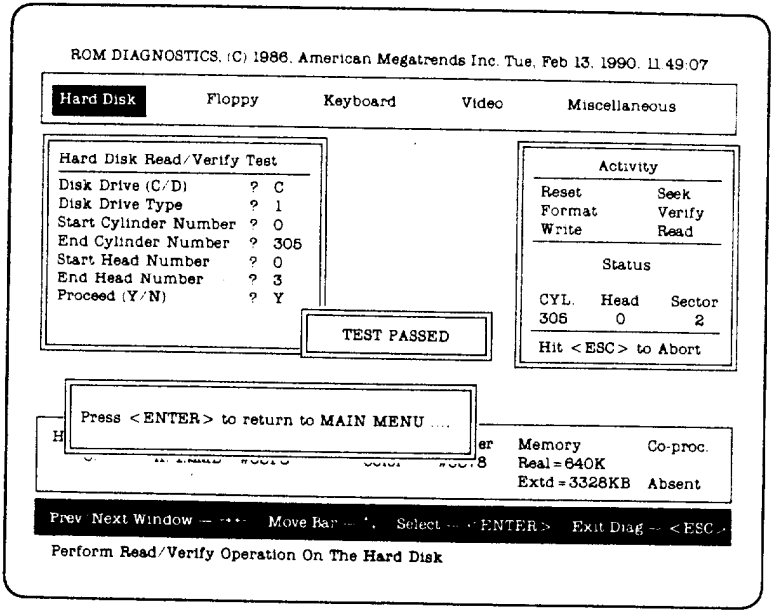


Figure E-10. Performing the Hard Disk Read/Verify Test

Check Test Cylinder Test

The last cylinder on the hard disk is the test cylinder. This cylinder should be tested if a C:Drive or D:Drive error occurs during the POST. A Read/Verify test is performed on all sectors in the test cylinder. This test should pass in at least one sector. If the test fails in all sectors, then one of two possible problems has occurred. Either the test cylinder itself is faulty, or too many cylinders were specified for the hard drive in the CMOS Setup program.

To perform the Check Test Cylinder Test:

At the Hard Disk menu, highlight "Check Test Cyl." using the bar cursor. Then, press **< ENTER > .** That causes the Hard Disk Test Cylinder Test box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These responses are addressed earlier in this tab under the heading "Hard Disk Format Test."

If you want to change a response to one or both of these fields before running the test, enter N at the "Proceed" field. This will return the cursor to the Disk Drive Type field unless the Disk Drive ID (C/D) has not been previously entered at the CMOS Setup screen. If this has not been done, the cursor will prompt you for an appropriate response at this field first.

After you have entered the appropriate information at the first two fields, enter "Y" at the "Proceed" field.

This causes the Activity box to appear on the right side of the screen. The words "Write" and "Verify" are highlighted in the upper half of the box. These flash while the test is in progress to indicate that these functions are being performed. In the lower half of this box, the status line displays the number of the last cylinder in the hard disk, the number of the the last head, and the sectors in sequence as they are tested. When this test is aborted or finished, press **< ENTER >** to return to the main menu.

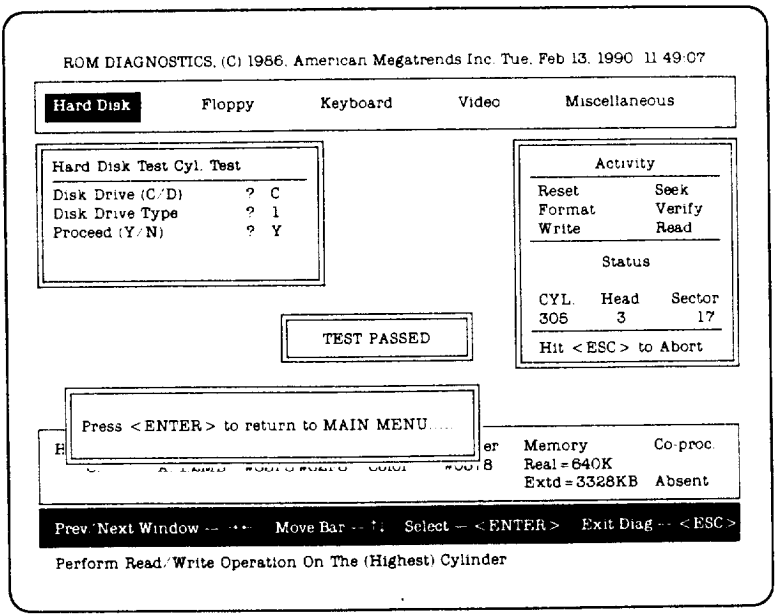


Figure E-11. Performing the Check Test Cylinder Test

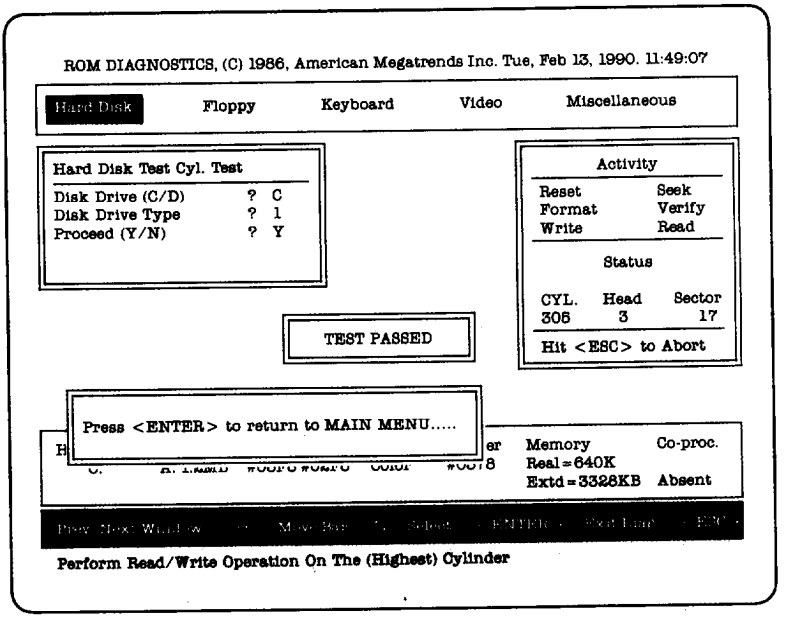
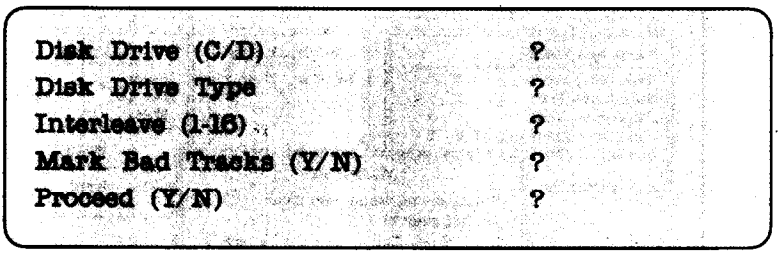


Figure E-11. Performing the Check Test Cylinder Test

Hard Disk Test Cylinder Test box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These responses are addressed earlier in this tab under the heading "Hard Disk Format Test."



After you have entered the appropriate information at the first four fields, enter "Y" at the "Proceed" field.

This causes the Activity box to appear on the right side of the screen. "Format" is highlighted in the upper half of the box. This flashes while the test is in progress to indicate that this function is being performed. In the lower half of this box, the status line displays the number of the cylinders, the number of the heads, and the number of the sectors in sequence as they are formatted. When this routine is finished, press **<ENTER >** to return to the main menu.

Floppy Diagnostics

There are five different tests which can be performed on a floppy drive. These are:

- Diskette Format Test
- Speed Test
- Random Read/Write Test
- Sequential Read/Write Test
- Disk Change Line Test

See Figure E-13.

> Warning!
> The Diskette Format Test, the Random Read/Write Test, and Sequential Readwrite Test are destructive operations. This means that the data on the diskette required to perform these tests will be destroyed. When performing these operations, be certain that the formatted diskettes required for these tests does not contain valuable information which cannot be recovered from the hard disk or from another diskette.

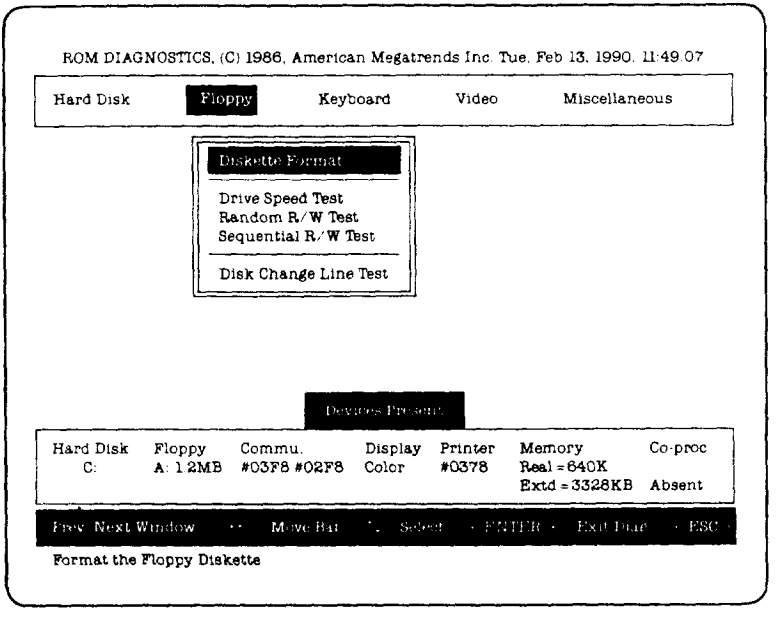


Figure E-13. The Floppy Diagnostics Menu

Error Messages

Error messages can either be ROM Diagnostics generated, or controller generated. The error messages encountered while performing any of the diskette functions are displayed in a window with 2 lines:

Line 1	***ERROR***
Line 2	The actual error message

The actual error message could be any one of the following:

ROM Diagnostics Generated Error Messages

```
Warning - Change line is inoperational
```

This error message is generated while running the "Disk change line test" if the program detects that the disk change is not working. This can also happen if you have not removed and reinserted the diskette as requested during the test. Replace the disk drive if you suspect a faulty drive.

```
CHANGE LINE Not Available
```

This error message is generated if the Disk change line test is performed on a 360KB or 72OKB drive.

Controller Generated Error Messages

- TIMEOUT error (Diskette drive not ready)
- BAD SEEK error (Seek operation failed)
- BAD CRC error (Cyclic redundancy check (CRC) error on diskette read)

- Diskette WRITE PROTECTED (Write protect error)
- MEDIA CHANGE error (Media type not found)
- BAD DMA error @MA overrun on operation)
- Record Not Found (Requested sector not found)
- BAD Address Mark (Address mark not found)

Floppy Diskette Format Test

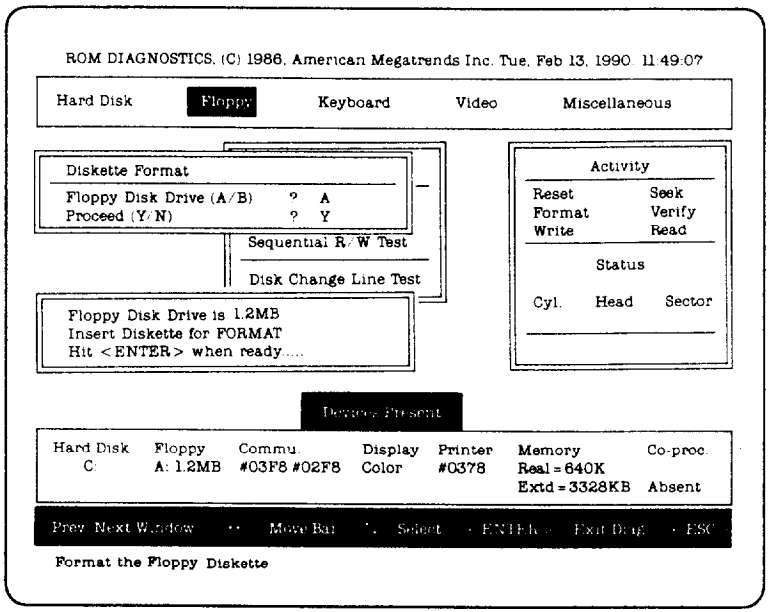


Figure E-14. The Diskette Format Test

This test determines the ability of the floppy disk controller to perform the low-level formatting function on a diskette.

> Note
> The diskettes formatted with this option do not contain the file structure necessary to accept files for an operating system such as DOS. To use this diskette as a storage medium for files created by any operating system, it must be formatted under the operating system that the diskettes will be used with.

Warning!
This test is a destructive operation. This means that the data on the diskette required to perform these tests will be destroyed. 'When performing these operations, be certain that the formatted diskettes required for these tests do not contain valuable information which cannot be recovered from the hard disk or from another diskette.

To perform a Diskette Format Test:

Highlight "Floppy" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists all possible tests available for the Floppy drive. At this Floppy Disk Menu, "Diskette format" should be highlighted with the bar cursor. Press < ENTER>. That causes the Diskette format box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These are:

```
Floppy Disk Drive (A/B)                    ?
Proceed (Y/N)                              ?
```

The response for the first field depends upon the response given in the CMOS Setup screen. If the response entered by the user at the CMOS Setup screen was "A," this field will automatically display "A." If the response entered by the user at the CMOS Setup screen was "B," this field will automatically display "B." When you are satisfied with the information entered for the first field, enter "Y" at the "Proceed" field.

Note
Entering "N" (the default) will return you to the Floppy Drive Menu.

Entering "Y" at the "Proceed" field causes the Activity box to appear on the right side of the screen. "Format" is highlighted in the upper half of the box. This flashes while the test is in progress to indicate that this, function is being performed. In the lower half of this box, the status line displays the number of the cylinders, the number of the heads, and the number of the sectors in sequence as they are formatted. When this test is finished, press **< ENTER >** to return to the main menu.

Drive Speed Test

This test determines the rotations speed of the drive. Consult your floppy drive documentation for acceptable tolerances.

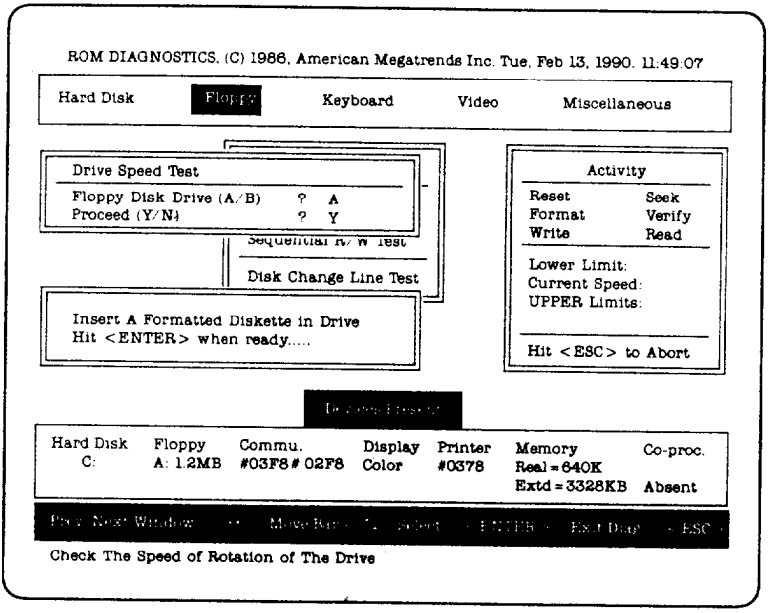


Figure E-15. The Drive Speed Test

To perfom a Drive Speed Test:

Highlight "Floppy" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists all possible tests available for the Floppy drive. At this Floppy Disk Menu. "Diskette format" should be highlighted with the bar cursor. Use the down arrow key to highlight "Drive Speed Test." Press **<ENTER >** . That causes the Diskette format box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These are:

```
Floppy Disk Drive (A/B)                    ?
Proceed (Y/N)                              ?
```

The response for the first field depends upon the response given in the CMOS Setup screen. If the response entered by the user at the CMOS Setup screen was "A," this field will automatically display "A." If the response entered by the user at the CMOS Setup screen was "B," this field will automatically display "B." To change the response, enter the appropriate value at the CMOS Setup screen. When you are satisfied with the information entered for the first field, enter "Y" at the "Proceed" field.

> Note
> Entering "N" (the default) will return you to the Floppy Drive Menu.

Entering "Y" causes two information boxes to appear: 1) a message box on the left side of the screen, and 2) the Activity box on the right side of the screen. The message box contains the following message:

```
Insert A Formatted Diskette in Drive
Press <ENTER>when ready...
```

After inserting a formatted diskette in the drive, and pressing <ENTER>, the message box will contain the following message:

```
Floppy Disk Drive is X.X MB
Diskette Capacity - XX trks & X secs/trk
Testing in Progress
```

At the bottom of the Activity box, the message "Wait for 2 minutes" will appear briefly as the test begins. The test will record a LOWER limit, and an UPPER limit during this time period. The Current Speed will flash.

> Note
> To abort the test, press < ESC >

When the test has been aborted or completed, press <ENTER> to return to the main menu.

Random Read/Write Test

This test performs a random read/write operation on the diskette, checking the random seek, read and write capability of the drive. The diskette used in this test must be formatted under the user's operating system before running the test.

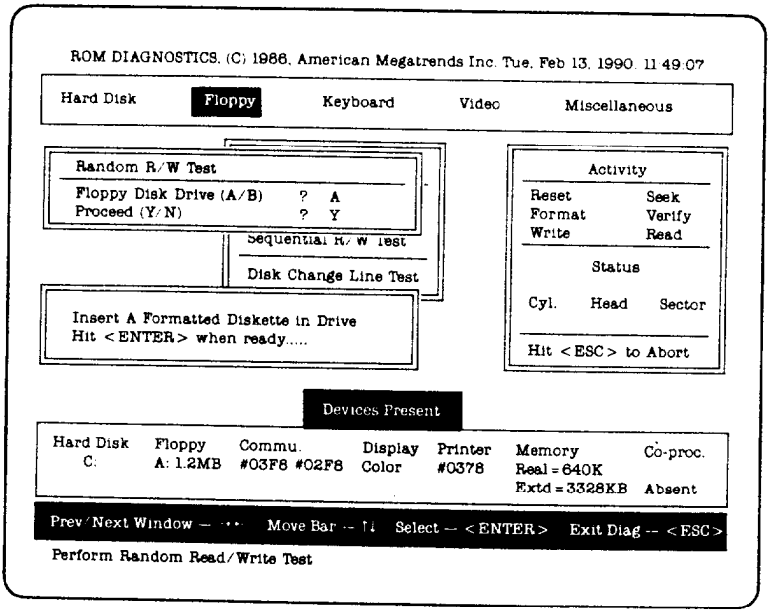


Figure E-16. The Random Read/Write Test

> Warning!
> This test is a destructive operation. This means that the data on the diskette required to perform these tests will be destroyed. When performing these operations, be certain that the formatted diskettes required for these tests does not contain valuable information which cannot be recovered from the hard disk or from another diskette.

To perform the Random Read/Write Test:

Highlight "Floppy" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists all possible tests available for the Floppy drive. At this Floppy

Disk Menu, "Diskette format" should be highlighted with the bar cursor. Use the down arrow key to highlight "Random ReadWrite Test." Press < ENTER > . That causes the Diskette format box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These are:

```
Floppy Disk Drive (A/B)                    ?
Proceed (Y/N)                              ?
```

The response for the first field depends upon the response given in the CMOS Setup screen. If the response entered by the user at the CMOS Setup screen was "A," this field will automatically display "A." If the response entered by the user at the CMOS Setup screen was "B," this field will automatically display "B." To change the response, enter the appropriate value at the CMOS Setup screen. When you are satisfied with the information entered for the first field, enter "Y" at the "Proceed" field.

> Note
> Entering "N" (the default) will return you to the Floppy Drive Menu.

Entering "Y" causes two information boxes to appear: 1) a message box on the left side of the screen, and 2) the Activity box on the right side of the screen. The message box contains the following message

```
Insert A Formatted Diskette in Drive
Press <ENTER> when ready...
```

After inserting a formatted diskette in the drive, and pressing c ENTER > , the message box will contain the following message:

```
Floppy Disk Drive is X.XXMB
Diskette Capacity - XX trks & X secs/trk
Testing in Progress
```

In the upper portion of the activity box, "Read," "Write," and "Verify" will flash in sequence as these operations are performed. In the Status portion of the Activity box, the cylinder numbers, head numbers, and sector numbers will be read, written, and verified.

> Note
> To abort the test, hit < ESC>

When the test has been aborted or completed, press < ENTER > to return to the main menu.

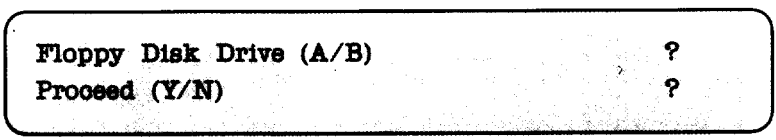
Sequential Read/Write lest

This test performs a sequential read/write operation, checking the sequential seek, read, and write capability of the drive. The diskette used in this test must be formatted under the user's operating system before running the test.

> Warning!
> This test is a destructive operation. This means that the data on the diskette required to perform these tests will be destroyed. When performing these operations, be certain that the formatted diskettes required for these tests does not contain valuable information which cannot be recovered from the hard disk or from another diskette.

To perform the Sequential Read/Write Test:

Highlight "Floppy" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists all possible tests available for the Floppy drive. At this Floppy Disk Menu, "Diskette format" should be highlighted with the bar cursor. Use the down arrow key to highlight "Sequential Read/Write Test." Press **< ENTER> .** That causes the Diskette format box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These are:



The response for the first field depends upon the response given in the CMOS Setup screen. If the response entered by the user at the CMOS Setup screen was "A," this field will automatically display "A." If the response entered by the user at the CMOS Setup screen was "B," this field will automatically display "B." To change the response, enter the appropriate value at the CMOS Setup screen. When you are satisfied with the information entered for the first field, enter "Y" at the "Proceed" field.

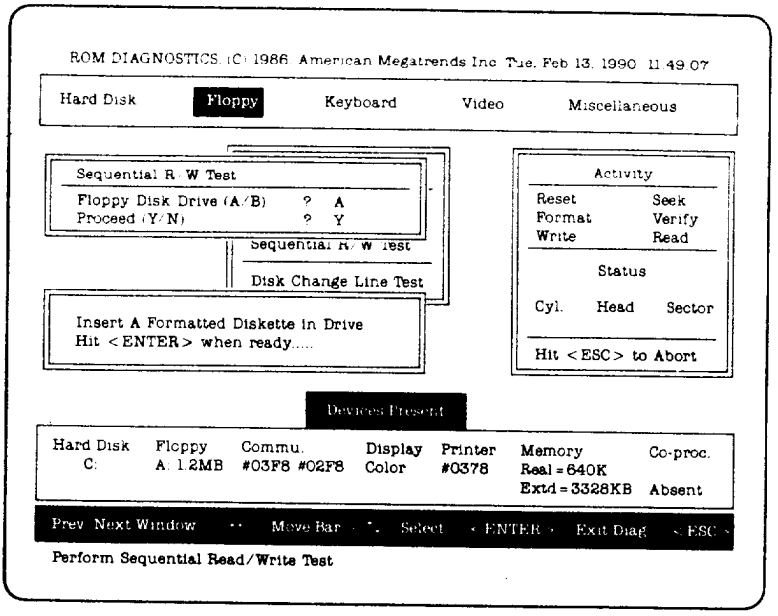


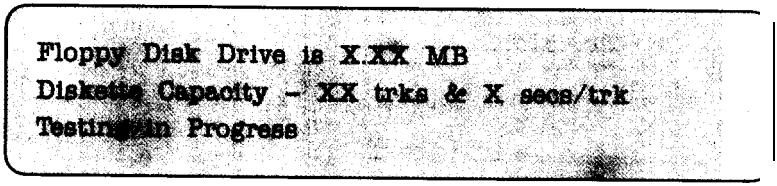
Figure E-17. The Sequential Read/Write Test

> Note
> Entering "N" (the default) will return you to the Floppy Drive Menu.

Entering "Y" causes two information boxes to appear: 1) a message box on the left side of the screen, and 2) the Activity box on the right side of the screen. The message box contains the following message:

```
Insert A Formatted Diskette in Drive
Press <ENTER> when ready...
```

After inserting a formatted diskette in the drive, and pressing <ENTER>, the message box will contain the following message:



In the upper portion of the Activity box, "Write," and "Verify" will flash in sequence as these operations are performed. In the Status portion of the Activity box, the cylinder numbers, head numbers, and sector numbers will be read, written, and verified sequentially by sector number. In other words, sector I will be written and verified for all 80 tracks, followed by sector 2, 3 and so on.

Note
To abort the test, press < ESC > .

When the test has been aborted or completed, press < ENTER> to return to the main menu.

Disk Change Line Test

This test verifies the disk change line capability of the floppy drive. A drive with disk line change capability allows the operating system to recognize that a new diskette has been inserted without accessing the Format Allocation Table (FAT). The diskette used in this test must be formatted under the user's operating system before running the test.

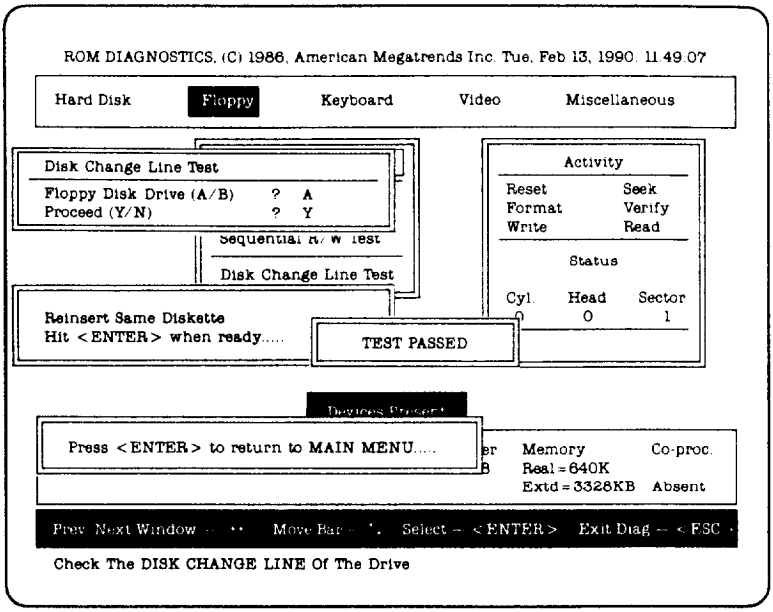


Figure E-18. The Disk Change Line Test

To perform the Disk Change Line Test:

Highlight "Floppy" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists all possible tests available for the Floppy drive. At this Floppy Disk Menu, "Diskette format" should be highlighted with the bar cursor. Use the down arrow key to highlight "Disk Change Line Test." Press **<ENTER >** . That causes the Disk Change Line Test box to appear on the left side of the screen. The box contains the following questions (fields) that must be answered with appropriate responses. These are:

```
Floppy Disk Drive (A/B)          ?
Proceed (Y/N)                    ?
```

The response for the first field depends upon the response given in the CMOS Setup screen. If the response entered by the user at the CMOS Setup screen was "A," this field will automatically display "A." If the response entered by the user at the CMOS Setup screen was "B," this field will automatically display "B." To change the response, enter the appropriate value at the CMOS Setup screen. When you are satisfied with the information entered for the first field, enter "Y" at the "Proceed" field.

> Note
> Entering "N" (the default) will return you to the Floppy Drive Menu.

Entering "Y" causes two information boxes to appear: 1) a message box on the left side of the screen, and 2) the Activity box on the right side of the screen. The message box contains the following message:

```
Remove Diskette from Drive
Press <ENTER> when ready...
```

After inserting a formatted diskette in the drive, and pressing < ENTER > , the Activity box will contain the following information:

In the upper portion of the Activity box, "Verify" will be highlighted. In the Status portion of the Activity box, the cylinder number will display "0," the head number will display "0," and the sector number will display "1." The message box will then contain the following message:

```
Reinsert Same Diskette
Press <ENTER> when ready...
```

In the upper portion of the Activity box, "Verify" will be highlighted. In the Status portion of the Activity box, the cylinder number will display "0," the head number will display "0," and the sector number will display "1." When the test has been completed, press **< ENTER >** to return to the main menu.

Keybord Diagnostics

There is only one Keyboard Diagnostics Test: the Scan/ASCII Code Test. This will help you determine whether the keys depressed match their Scan and ASCII codes.

Every time you depress a key to verify its code, the scan code and ASCII code of the key displays on the screen. The key symbol will also be displayed on the keyboard display in its proper location.

To perform the Scan/ASCII Code Test:

Highlight "Keyboard" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists the Scan/ASCII Code Test. Press **< ENTER > .** This causes a screen keyboard layout to display. Scan code and ASCII Code fields rest above the keyboard layout on the screen.

To test the keyboard, press the keys on the keyboard. The scan codes and ASCII codes display in the appropriate fields for each key as it is pressed. Use this test to verify the codes with their respective keys. Performing this test will help you to identify and faulty keys. Use the following tables to verify the codes with the keys.

Press **< CTRL > < BREAK >** to leave this test.

Video Diagnostics

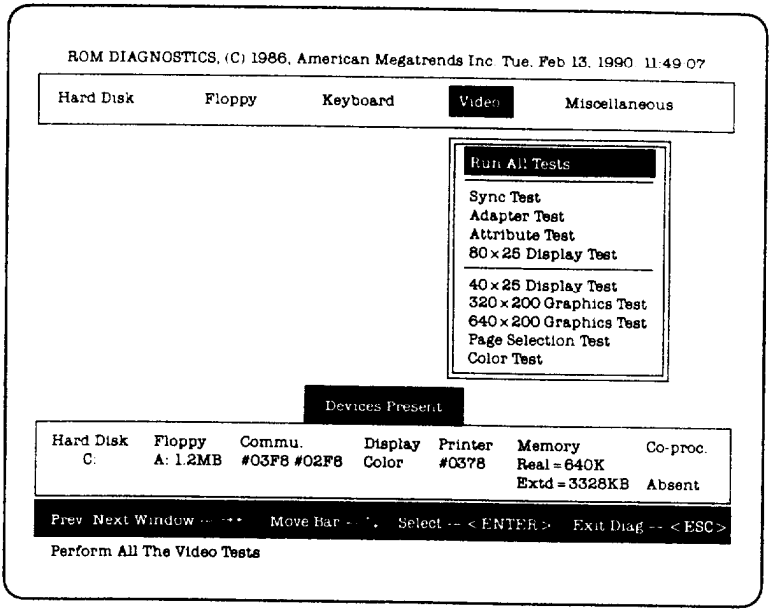


Figure E-19. Video Tests

The range of video tests available depends upon the type of display adapter card installed in the system. The following tests are available for both monochrome and color display adapters and monitors:

- *Sync Test* — This checks the sync capability.
- *Adapter Test* — This performs a test on the display memory.
- *Attribute* Test — This checks the attributes of the display.
- *80x25 Display Test* — This checks the 80x25 character set of the display adapter.

These tests are available for systems with a color display card and color monitor:

- 40x25 Display Test
- 320x200 Graphics Test
- *640x200* Graphics Test
- Page Selection Test
- Color Test

Test results for all diagnostics functions except the Sync Test are displayed on the screen. To perform any of these visual tests:

Highlight "Video" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists the various tests. "Run All Tests" is highlighted with a block cursor. To highlight and of the visual tests below the Sync Test, use the up and down arrow keys. Press < ENTER > to initiate test and follow onscreen messages.

Error Messages
ROM Diagnostics Generated Error Messages

"DISPLAY MEMORY R/W ERROR"

This error message is generated if the Adapter Test detects any R/W error in the display memory. This message indicates a video controller problem.

Miscellaneous Diagnostics

These include the following tests: 1) Printer Port Test, and 2) Serial Communication Port Test.

Printer Adapter Test

This test writes a pattern on the printer. The results are observed here. If the printer does not write, then the test has failed.

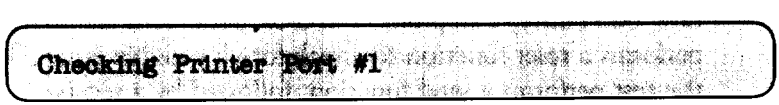
Error Messages

- Error - Printer Out of Paper
- Error - Printer Not Selected
- Error - Printer Interface I/O Error
- Error - Time Out On Printer

All error messages except for "Printer Out of Paper" indicate a problem with the controller.

To perform the Printer Adapter Test:

Highlight "Miscellaneous" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists the two tests. "Printer Adapter Test" is highlighted with a block cursor. Press **< ENTER > . The** message box in the middle of the screen displays the following message:



When the test is completed, press **<ENTER>** to return to the main menu. .

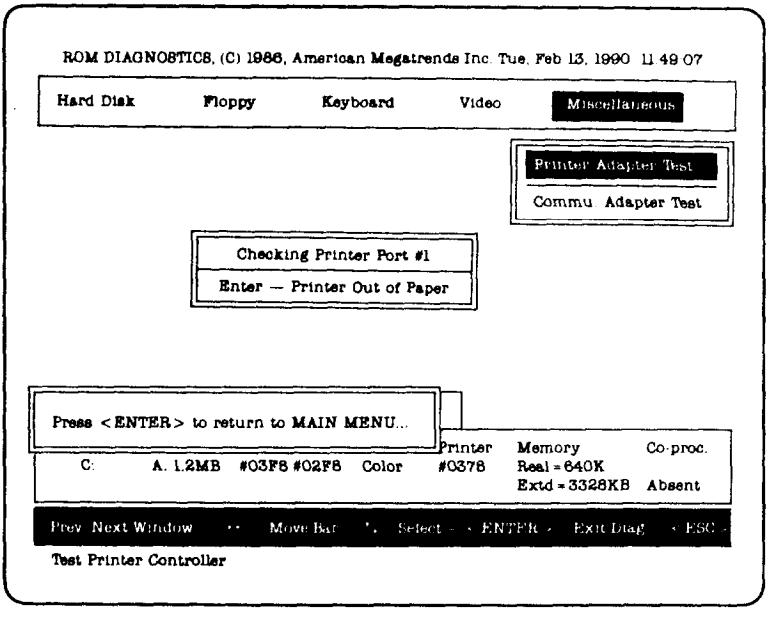


Figure E-20. The Printer Adapter Test

Serial Communication Adapter Test

This test requires a special RS-232 Turn-Around Connector plugged into the port. It must be jumpered as follows:

- TXD & RXD (2 & 3) shorted
- RTS & CTS (4 & 5) shorted
- DSR & DTR (6 & 20) shorted

This test is programmed to read the following data: 9600 baud rate, odd parity, 2 stop-bits, and 8-bit data. This test first performs a reset function to check for all possible errors. Then, the test performs a send function, followed by a receive function.

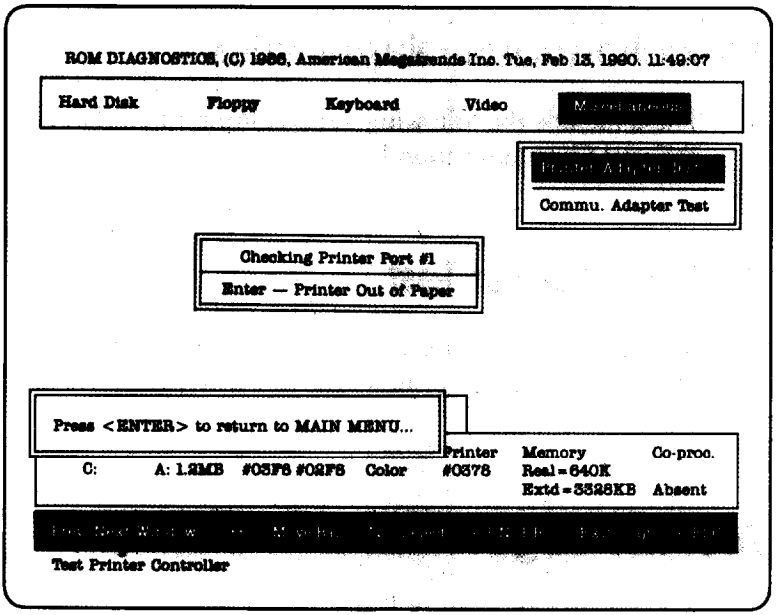


Figure E-20. The Printer Adapter Test

Serial Communication Adapter Test

This test requires a special RS-232 Turn-Around Connector plugged into the port. It must be jumpered as follows:

- TXD & RXD (2 & 3) shorted
- RTS & CT'S (4 & 5) shorted
- DSR & DTR (6 & 20) shorted

This test is programmed to read the following data: 9600 baud rate, odd parity, 2 stop-bits, and 8-bit data. This test first performs a reset function to check for all possible errors. Then, the test performs a send function, followed by a receive function.

- Error - Time out!
- Error - Break Detected
- Error - Framing error
- Error - Parity error
- Error - Overrun error

If a time out error occurs during the send and receive portions, this indicates a problem with the communication adapter controller.

To perform the Serial Communication Port Test:

Highlight "Miscellaneous" in the main menu by using the left and right arrow keys. Below this menu is another menu which lists the two tests. "Printer Adapter Test" is highlighted with a block cursor. To highlight "Comm. Adapter Test," use the down arrow key. Press <ENTER>. The RS-232C Connector Details Information box will appear. This box displays the jumper settings. The message line at the bottom of the box will prompt you for an answer to the following question:

```
Are the Pins Connected as Above? (Y/N)
```

The message box in the middle of the screen displays:

```
Checking Serial Port #1
```

Typing an "N" will return you to return to the main menu. Typing a "Y" will initiate the test.

The message box in the middle of the screen displays:

```
Press <ESC> to Stop Test
Transmit & Receive OK - Testing On
```

This test will run for about **2** minutes. Press **<ENTER >** to return to the main menu when the test is completed.

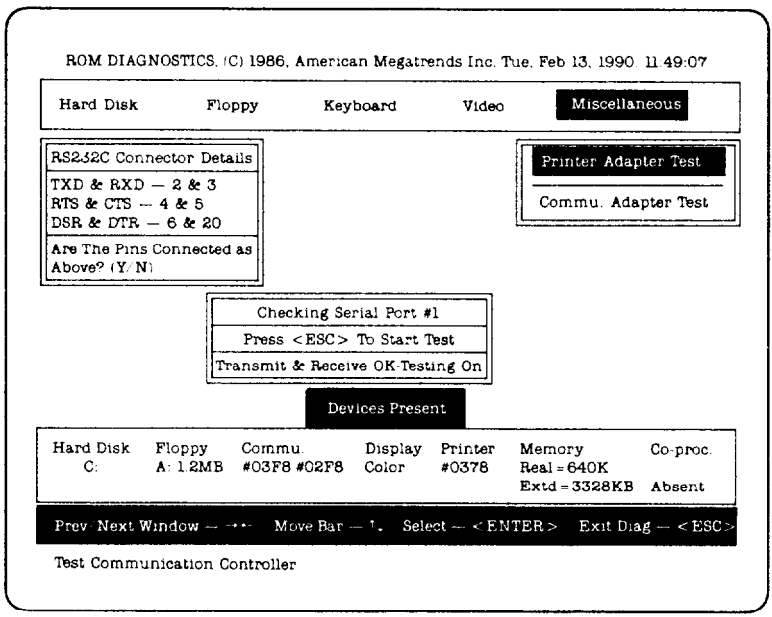


Figure E-21. Serial Communication Adapter Test

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